North Carolina Department of Transportation
Statewide Planning Branch
Urban Studies Unit C

Thoroughfare Plan Technical Report

October, 1997

THOROUGHFARE PLAN
TECHNICAL REPORT

for the

CITY OF MONROE

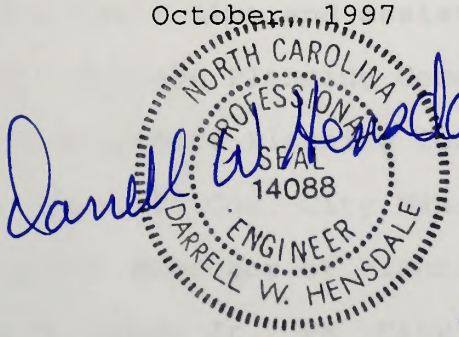
Prepared by the:

Urban Studies Unit C
Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In Cooperation with the:

City of Monroe
and the
Federal Highway Administration
U. S. Department of Transportation

October, 1997



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CONTENTS

CONTENTS

DATA TABLES

FIGURES

I. INTRODUCTION

Transportation system efficiency plays a vital role in our economy and way of life. The transportation system is used every day by the business, governmental, and residential sectors of our economy. To insure that individual highway projects eventually form a cohesive, coordinated system, a **thoroughfare plan** is developed.

The North Carolina General Assembly enacted legislation in 1959 that directed the Highway Commission and the State's municipalities to work cooperatively to develop thoroughfare plans that would accommodate existing and future travel within the urban areas.

The first thoroughfare plan developed for Monroe was a sketch plan prepared in 1959, but never adopted. In 1964 a more comprehensive thoroughfare plan study was begun and a resultant plan mutually adopted in 1966. In 1974 another study was begun to consider a revised thoroughfare plan. Agreement was not reached until 1980 when the second mutually adopted thoroughfare plan was signed and sealed. In 1989, a revision was made to the 1980 thoroughfare plan when the proposed Northern Loop was added, making this the third mutually adopted thoroughfare plan. Due to unexpected development, mainly the Monroe Mall, a supplemental traffic model analysis was conducted in 1981 to adjust projected traffic volumes, but the adopted thoroughfare plan map remained unchanged.

This report documents another thoroughfare plan reevaluation process that started with data collection in 1992. It sets forth thoroughfare improvement recommendations and preliminary environmental screening of recommended projects. It is intended as a reference for future transportation studies and a mutual guide to the City and the Department for the implementation of the adopted thoroughfare plan.

The system of thoroughfares proposed was developed following the principles of thoroughfare planning outlined in Chapter II of this report. A Citizens' Workshop was held on November 7, 1996 and a Public Hearing held on December 3, 1996 to disseminate information and receive comments on the proposed thoroughfare plan. The latest plan dated December 17, 1996 was **mutually adopted** by the City of Monroe on December 17, 1996 and by the North Carolina Department of Transportation on February 7, 1997.

Appendix C illustrates the adopted plan and details the street inventory and recommendations considered necessary for proper traffic circulation through the design year 2020.

II. THOROUGHFARE PLANNING PRINCIPLES

Objectives

Typically, the urban street system occupies 25 to 30 percent of the total developed land in an urban area. Since the system is permanent and expensive to build and maintain, much care and foresight are needed in its development. Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system to meet existing and future travel desires within the urban area.

The primary goal of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with the changing traffic patterns. A thoroughfare plan will enable street improvements to be made as traffic demands increase. It will also help eliminate unnecessary improvements, so that needless expense can be averted. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs, the thoroughfare plan should include those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future residential, commercial, and industrial development affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

(1) providing for the orderly development of an adequate major street system as land development occurs;

(2) reducing travel and transportation costs;

(3) reducing the cost of major street improvements to the public through the coordination of the street system with private action;

(4) enabling private interests to plan their actions, improvements, and development with full knowledge of public intent;

(5) minimizing the disruption and displacement of people and businesses through long-range advance planning for major street improvements;

(6) reducing environmental impacts, such as air pollution, resulting from transportation; and

(7) increasing travel safety.

Thoroughfare planning objectives are achieved by both improving the operational efficiency of thoroughfares and by improving the system efficiency through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry more vehicular traffic and people. In terms of vehicular traffic, a street's capacity is defined by the maximum number of vehicles which can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to increase vehicular capacity include street widening, intersection upgrades, more efficient signalization, improvements to the vertical and horizontal alignment, and the elimination of roadside obstacles. For example, widening a street from two to four lanes more than doubles the capacity of the street by providing additional maneuverability for traffic. This reduces the impedances to traffic flow caused by slow moving or turning vehicles and the adverse effects of horizontal and vertical alignments.

Methods for improving the operational efficiency of a street, thus increasing its capacity, include:

(1) **Control of access** -- A roadway with complete access control can often carry three times the traffic handled by a uncontrolled access street with identical lane width and number.

(2) **Parking removal** -- An increase in capacity can be realized by removing on-street parking. This provides additional street width for traffic flow and reduces the friction to traffic flow caused by parking vehicles.

(3) **One-way operation** -- The capacity of a street can sometimes be increased 20-50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.

(4) **Reversible lanes** -- Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.

(5) **Signal phasing and coordination** -- Coordinated signals and proper signal phasing allow for smoother traffic flow and reduce excessive stop-and-go operation.

Altering travel demand is another way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

(1) encouraging people to form car pools and van pools for journeys to work and other trip purposes: this reduces the number of vehicles on the roadway and raises the people-carrying capability of the street system;

(2) encouraging the use of transit and bicycle modes;

(3) encouraging industries, businesses, and institutions to stagger work hours or establish variable work hours for employees: this will spread peak travel over a longer time period and thus reduce peak hour demand;

(4) planning and encouraging land use development or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost to the user. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Functional Classification

Streets perform two primary functions: **traffic service** and **land service,** which, when combined, are basically **incompatible.** This conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely used abutting property lead to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets which permits travel from origins to destinations with directness, ease, and safety. Different streets in the system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict. Streets are categorized by function as local access streets, minor thoroughfares, or major thoroughfares (See Figure 1).

Local Access Streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located so that only traffic with origins and destinations on these streets would be served. Local streets may be further classified as either residential, commercial, and/or industrial depending upon the type of land use which they serve.

Minor Thoroughfares are more important streets on the city system. They collect traffic from local access streets and carry it to the major thoroughfares. They may in some instances supplement the major thoroughfare system by facilitating minor through-traffic movements. A third function that may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major Thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and inter-city traffic. The streets which comprise the major thoroughfare system may also serve abutting property; however, their principal function is to carry traffic. They should not be bordered by uncontrolled strip development because such development

significantly lowers the capacity of the thoroughfare. In addition, each driveway is a danger and an impediment to traffic flow. Major thoroughfares may range from two-lane streets carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfares forms the basic framework of the urban street system. A major thoroughfare system which is very adaptable to desire lines of travel within an urban area is the radial-loop system. It permits movement between various areas of the city with maximum directness. This system consists of several functional elements: radial streets, cross-town streets, loop system streets, and bypasses (Figure 1).

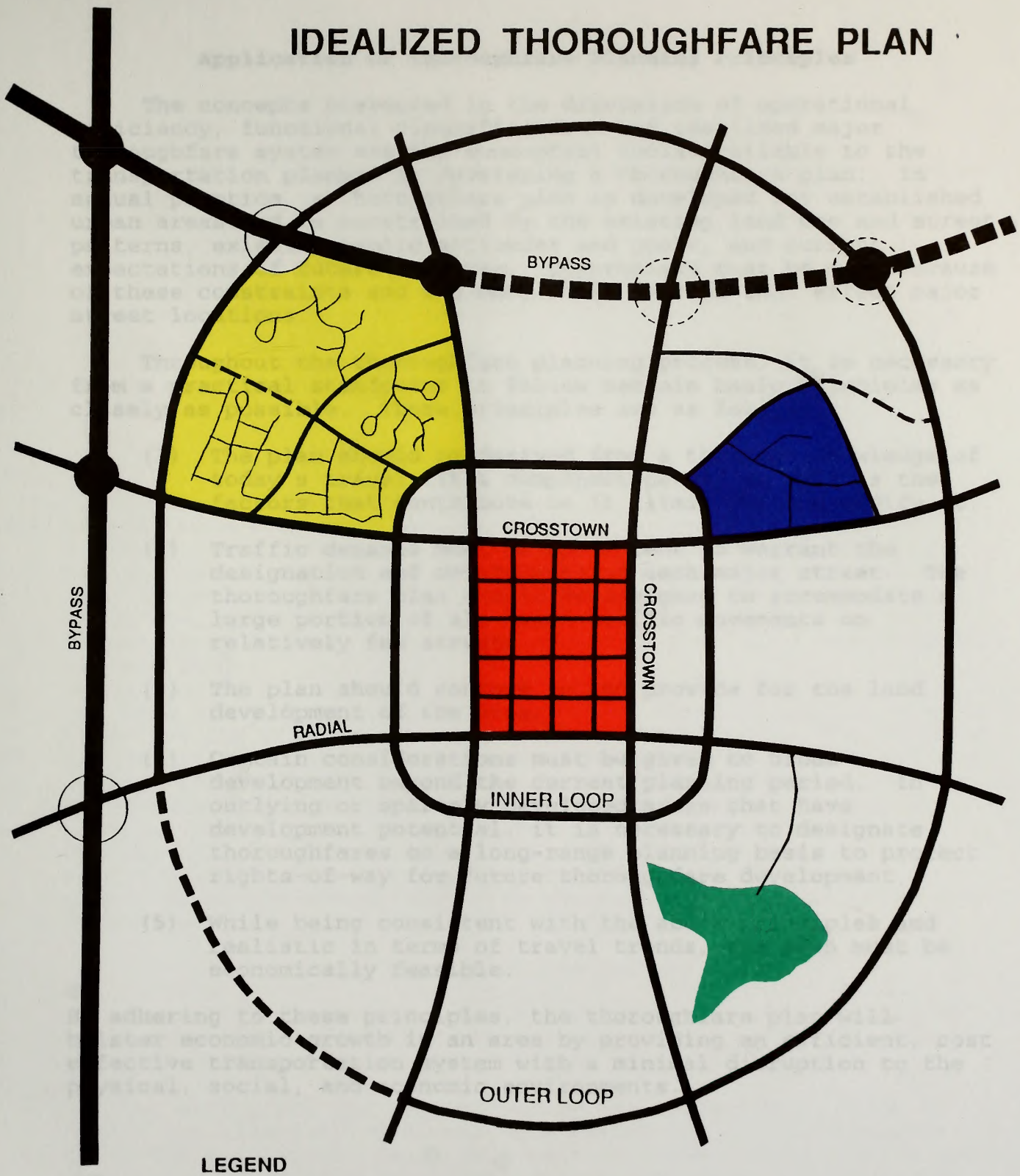
Radial streets provide for traffic movement between points located on the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of **cross-town streets** that form a loop around the central business district. This system allows traffic moving from one side of the central area to the other to follow the area's perimeter. It also allows central area traffic to circle and then re-enter the central area nearer to a given destination. The effect of a good cross-town system is to free the central area of cross-town traffic, thus permitting the central area to function more adequately in its role as a business or pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central area congestion. There may be one or more loops, depending on the size of the urban area. They are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A **bypass** is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing traffic which has no desire to be in the city. Bypasses are usually designed to through-highway standards, with control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

IDEALIZED THOROUGHFARE PLAN



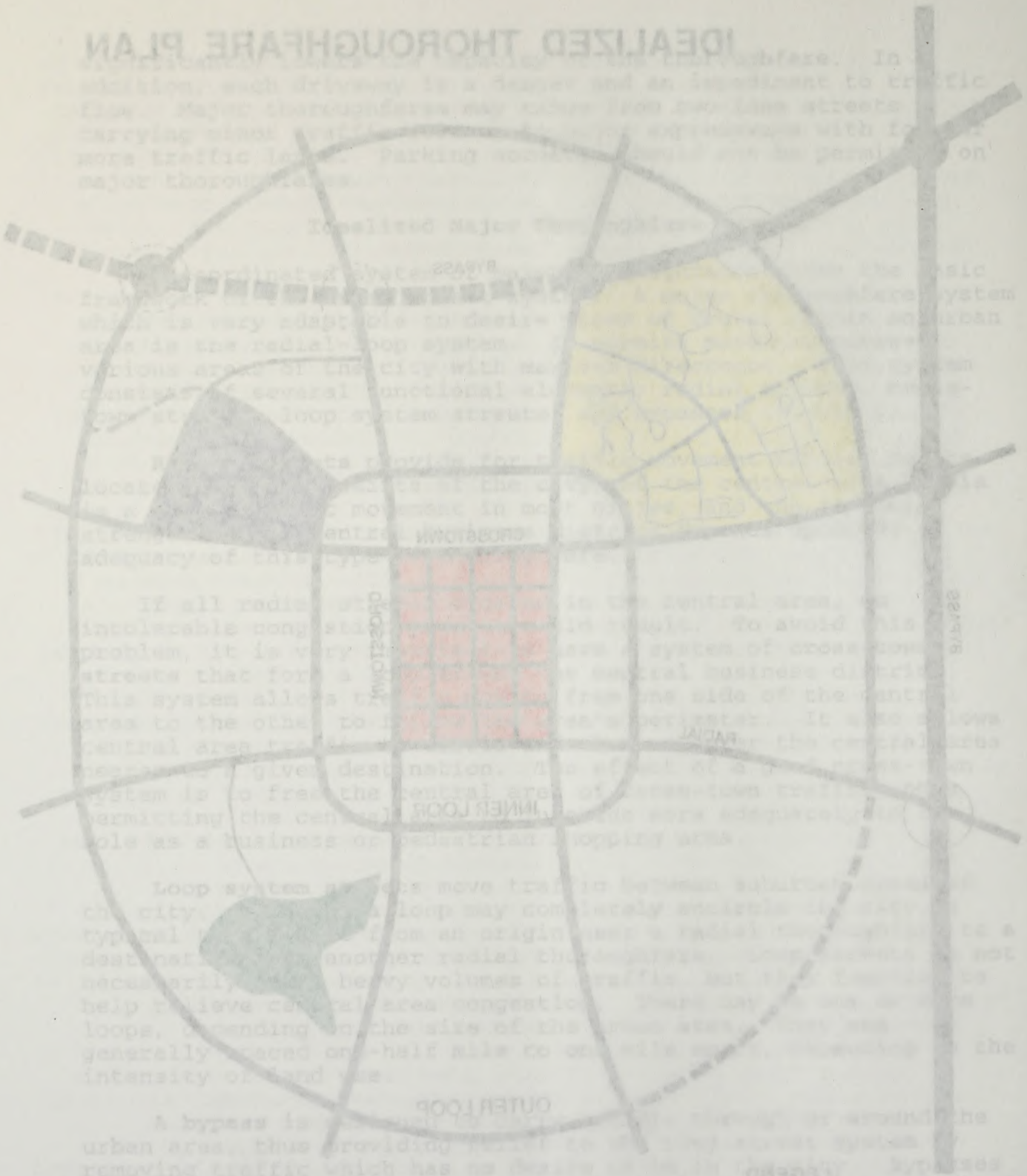
LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARE FREEWAY	▬▬▬	■■■■
MAJOR OTHER	▬▬▬	▬ ▬ ▬ ▬
MINOR THOROUGHFARE	▬▬▬	▬ ▬ ▬ ▬
LOCAL ROAD	▬▬▬	
INTERCHANGE	●	●
GRADE SEPERATION	○	○

LAND USES

- COMMERCIAL/BUSINESS
- RESIDENTIAL
- INDUSTRIAL
- PUBLIC/INSTITUTIONAL

FIGURE 1


CROSSTOWN
RADIAL
INNER LOOP
OUTER LOOP
BYPASS

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, a thoroughfare plan is developed for established urban areas and is constrained by the existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these constraints and the many other factors that affect major street locations.

Throughout the thoroughfare planning process, it is necessary from a practical standpoint to follow certain basic principles as closely as possible. These principles are as follows:

(1) The plan should be derived from a thorough knowledge of today's travel, it's component parts, as well as the factors that contribute to it, limit it, and modify it.

(2) Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of all major traffic movements on relatively few streets.

(3) The plan should conform to and provide for the land development of the area.

(4) Certain considerations must be given to urban development beyond the current planning period. In outlying or sparsely developed areas that have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights-of-way for future thoroughfare development.

(5) While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

By adhering to these principles, the thoroughfare plan will bolster economic growth in an area by providing an efficient, cost effective transportation system with a minimal disruption to the physical, social, and economic environments.

III. POPULATION, LAND USE AND ECONOMIC CONDITIONS

The Planning Area

The City of Monroe is located in the southern Piedmont region of North Carolina. Almost perfectly centered, it is the county seat of Union County. The Monroe area also supports a strong manufacturing and agricultural product processing economy, as well as a large retail sector. Monroe is located just 20 miles southeast of the City of Charlotte, and Charlotte's economic influence can be seen in Monroe's rapid growth in the northwest quadrant of the planning area. The Transportation Planning Area (TPA) includes the City and surrounding areas expected to be urban within about twenty five years (see Figure 3).

Factors Affecting Transportation

Population, economic activity, land use and vehicle usage trends are the determining factors of the transportation needs of a city. Other factors which influence the design and location of transportation facilities are legal controls such as subdivision regulations and zoning ordinances, availability of public utilities, and the topography of an area. Hopefully, reliable forecasts of future travel can be achieved when all these factors are analyzed.

The first step in the development of the thoroughfare plan is to define the planning period and the planning area. The planning period for this study is 28 years. The base year is 1992 and the design year 2020. The planning area is the city limits plus the surrounding areas expected to become urban in nature during the planning period. The planning area is further divided into traffic analysis zones. These are areas in which the socio-economic and traffic data can be counted, categorized and projected to the design year with the best methods available today (see Figure 3).

Population and Housing

Travel is directly related to the magnitude and location of the population, and traffic volumes are closely related to the size and distribution of the adjoining areas they serve.

An employment and housing survey was conducted in order to obtain the 1992 socio-economic data needed for traffic analysis. Using the population trends as a control factor, the planning area population was determined by applying an occupancy factor to the actual number of dwelling units (DU's) counted. This methodology becomes more understandable when we use it to project future dwelling unit distribution. As can be seen from the graph (see Figure 4), the DU occupancy rate has been and is expected to decline. The base year rate used for the planning area is (2.70) persons/DU which is between the county (2.81) and township (2.65) rates. A design year rate of (2.50) was estimated from the graph in Figure 4.

The TPA population is determined by multiplying the (DU occupancy rate) X (DU's counted). This analysis yields: (2.7) X (9,598) = 25,914. For simplicity, 25,900 will be used as base year TPA population. A breakdown of housing by zone, and other data necessary for the analysis process is shown in Appendix A, Table 1. A graphical analysis to further verify TPA population is performed by comparing growth rates for the state, Union County, Monroe and the Transportation Planning Area is shown in Figure 5.

Since household income affects trip making characteristics, the DU's were stratified into five categories during the data collection process. These categories are based on estimated property values and are a surrogate measure for household income. Each housing category was assigned a specific trip generation rate which is also shown in Appendix A, Table 1.

The projection of population to the design year 2020 was the next step in the analysis. Projections for the state and for Union County, supplied by the Demographic Unit, Office of State Budget and Management were used as control factors (see Figure 5). The City of Monroe Planning Staff provided assistance in allocating population growth to specific traffic zones within the planning area.

The projection technique involved converting the population trends (see Figure 5) to compound growth rates that could be easily compared among the different governmental jurisdictions. A 1.45% yearly rate was chosen for the planning area, because it was felt that the area was growing faster than the state as a whole and but somewhat less than Union County that is heavily influenced by the Charlotte urban expansion. This rate translated into a population projection of 39,000 for the planning area.

GEOGRAPHIC LOCATION MAP FOR MONROE

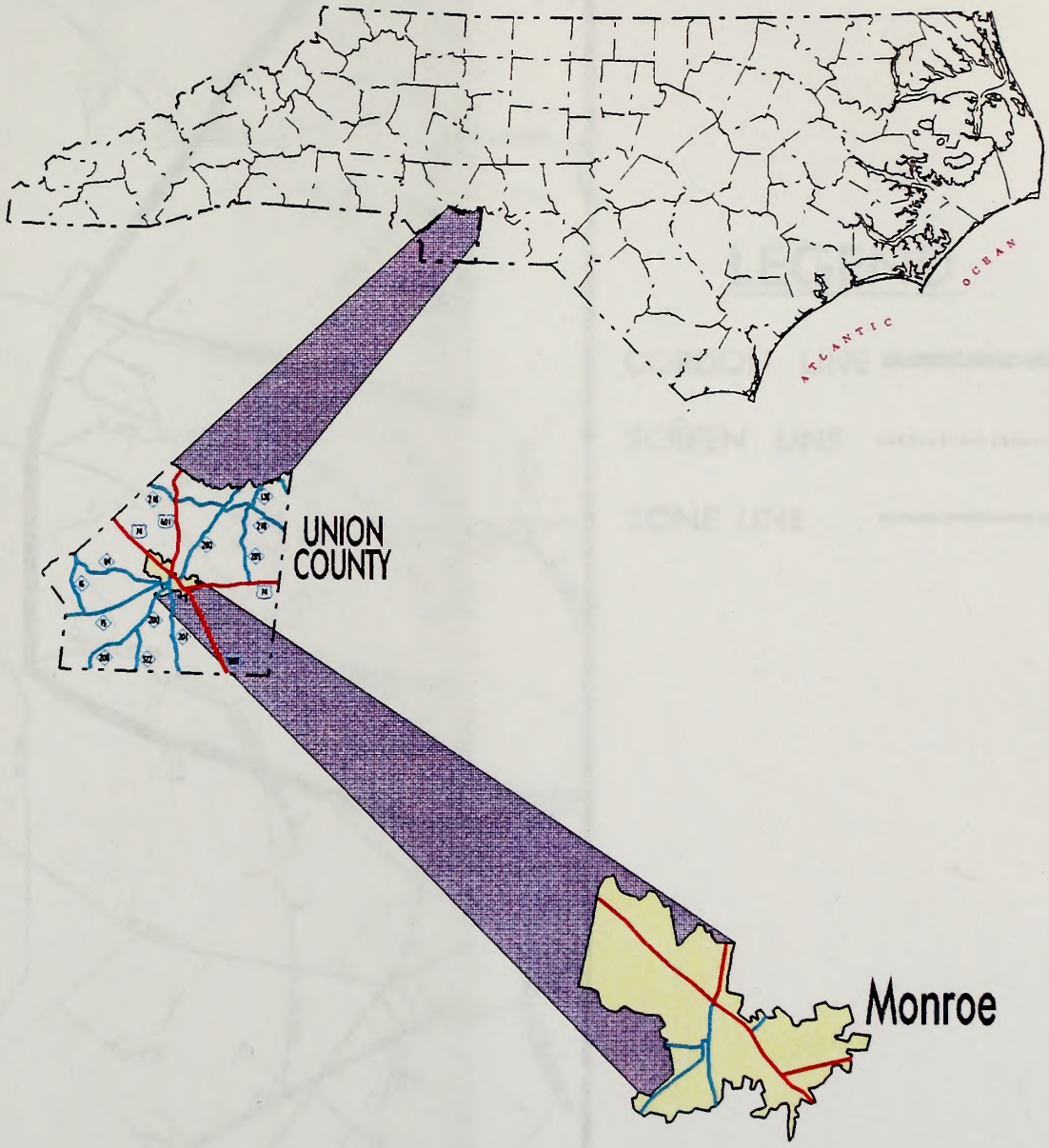
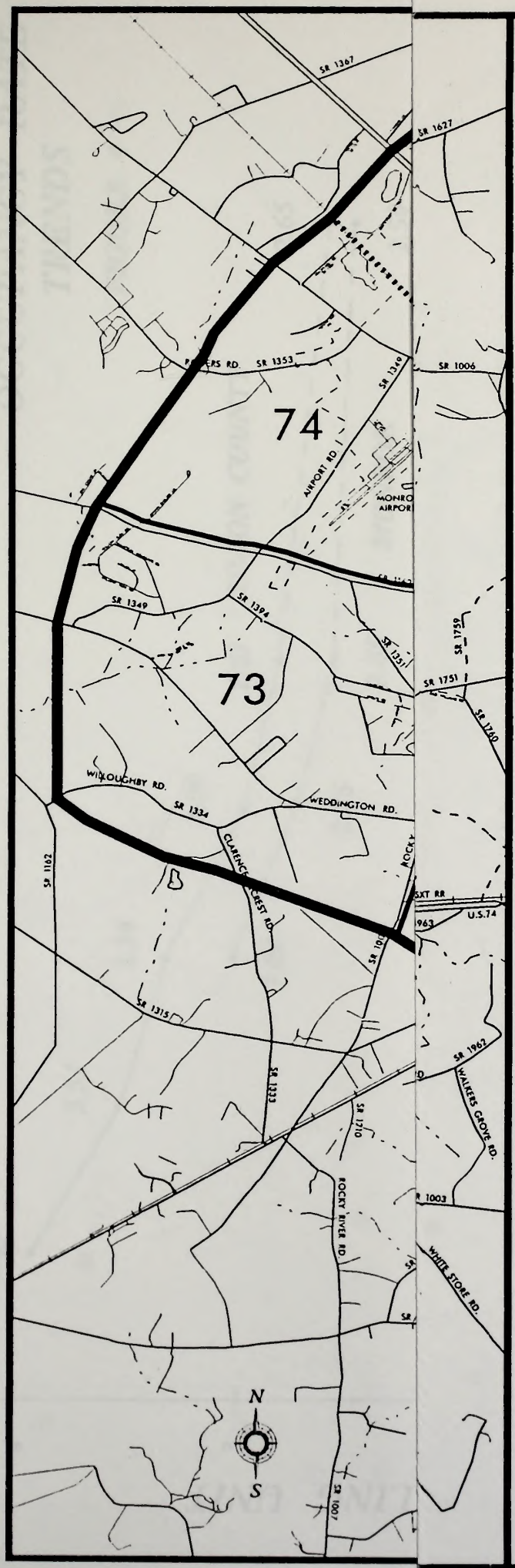


FIGURE 2

Monroe



ZONE MAP

FIGURE 3

LEGEND

CORDON LINE

SCREEN LINE

ZONE LINE

MONROE

UNION COUNTY NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS–STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE

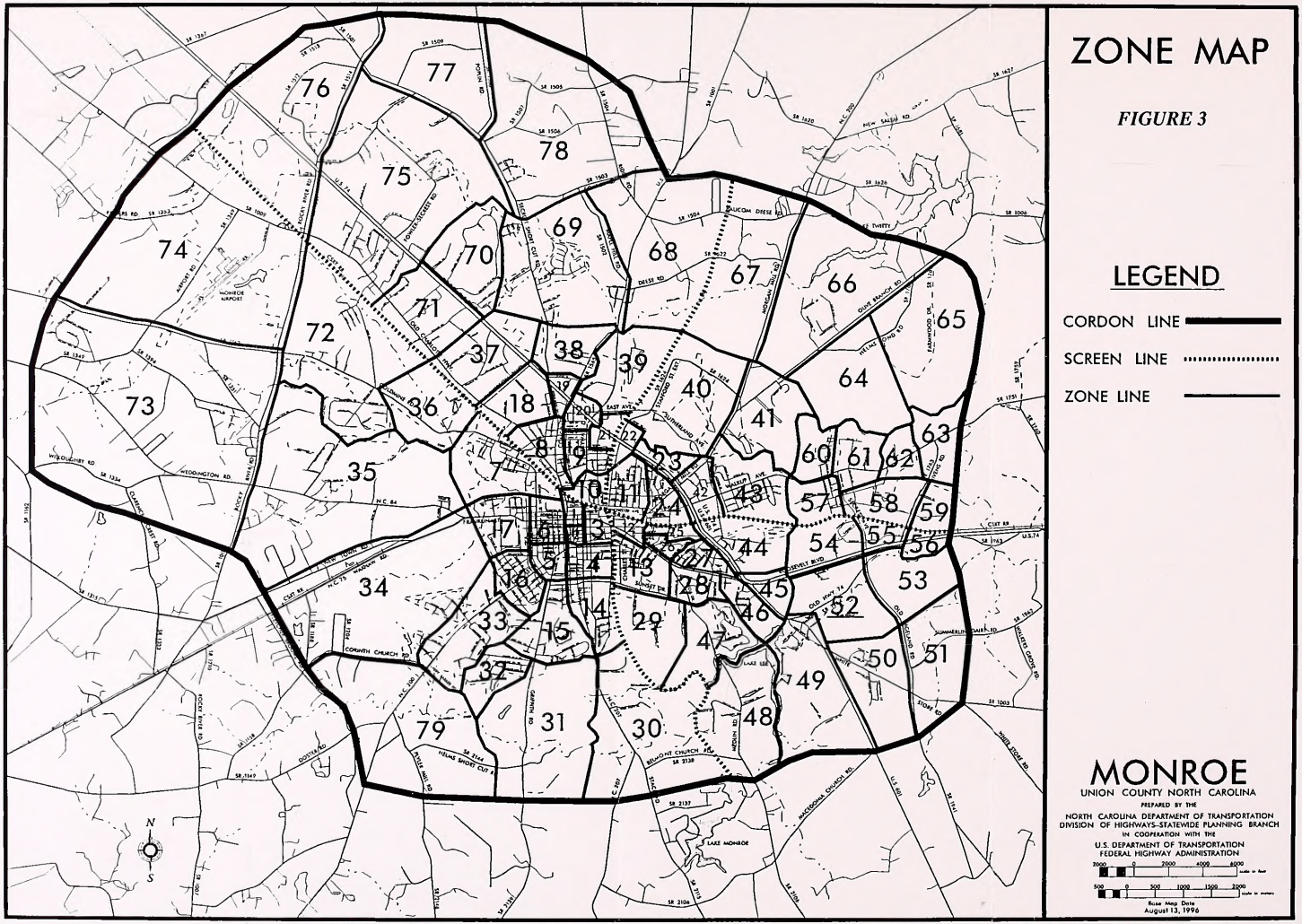
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

2000 0 2000 4000 6000 scale in feet

500 0 500 1000 1500 2000 scale in meters

Base Map Date
August 13, 1996


Monroe


ZONE MAP
FIGURE 3
LEGEND
CORDON LINE
SCREEN LINE
ZONE LINE
MONROE
UNION COUNTY NORTH CAROLINA
PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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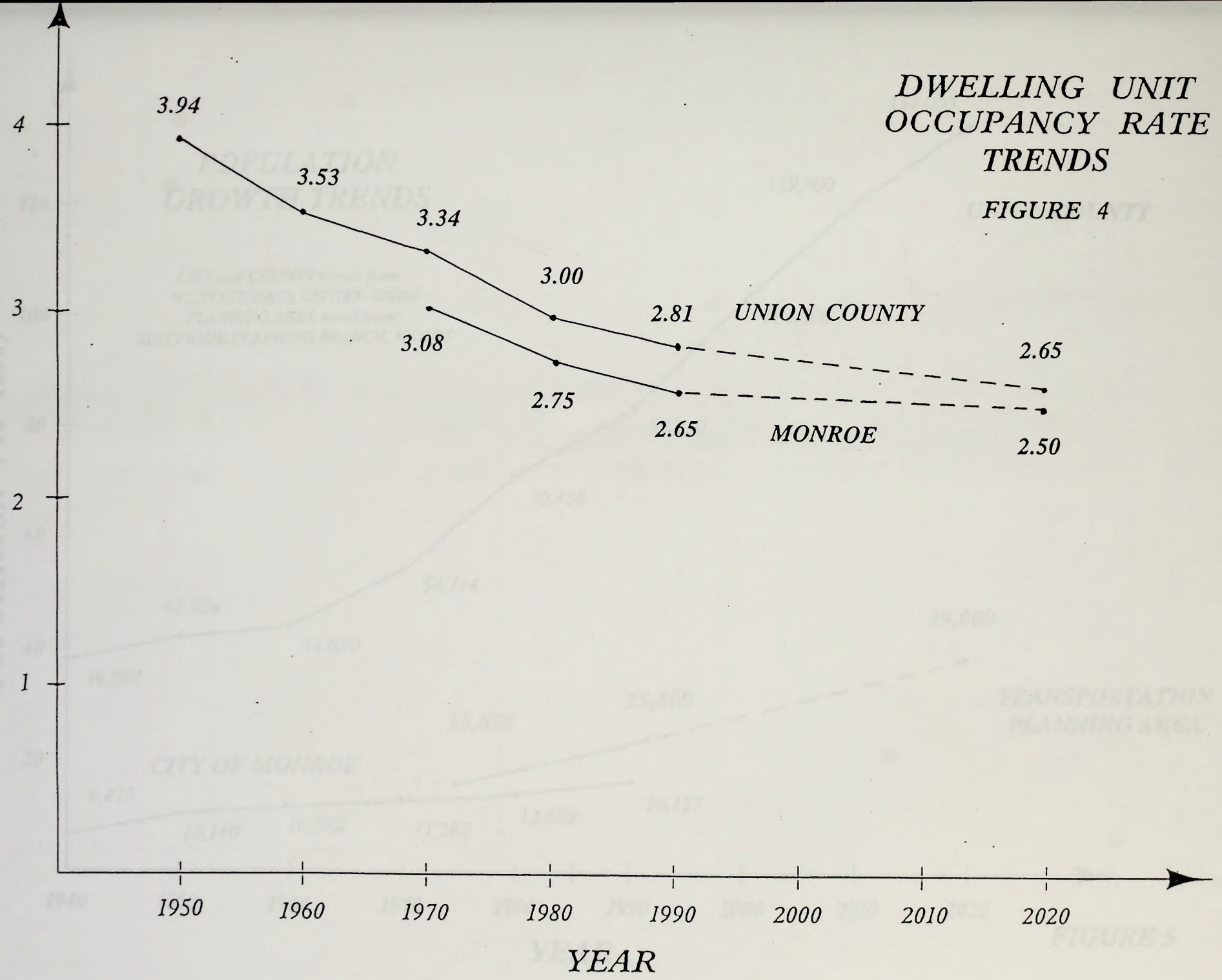
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
Base Map Date
August 13, 1996

DWELLING UNIT OCCUPANCY RATE TRENDS

FIGURE 4



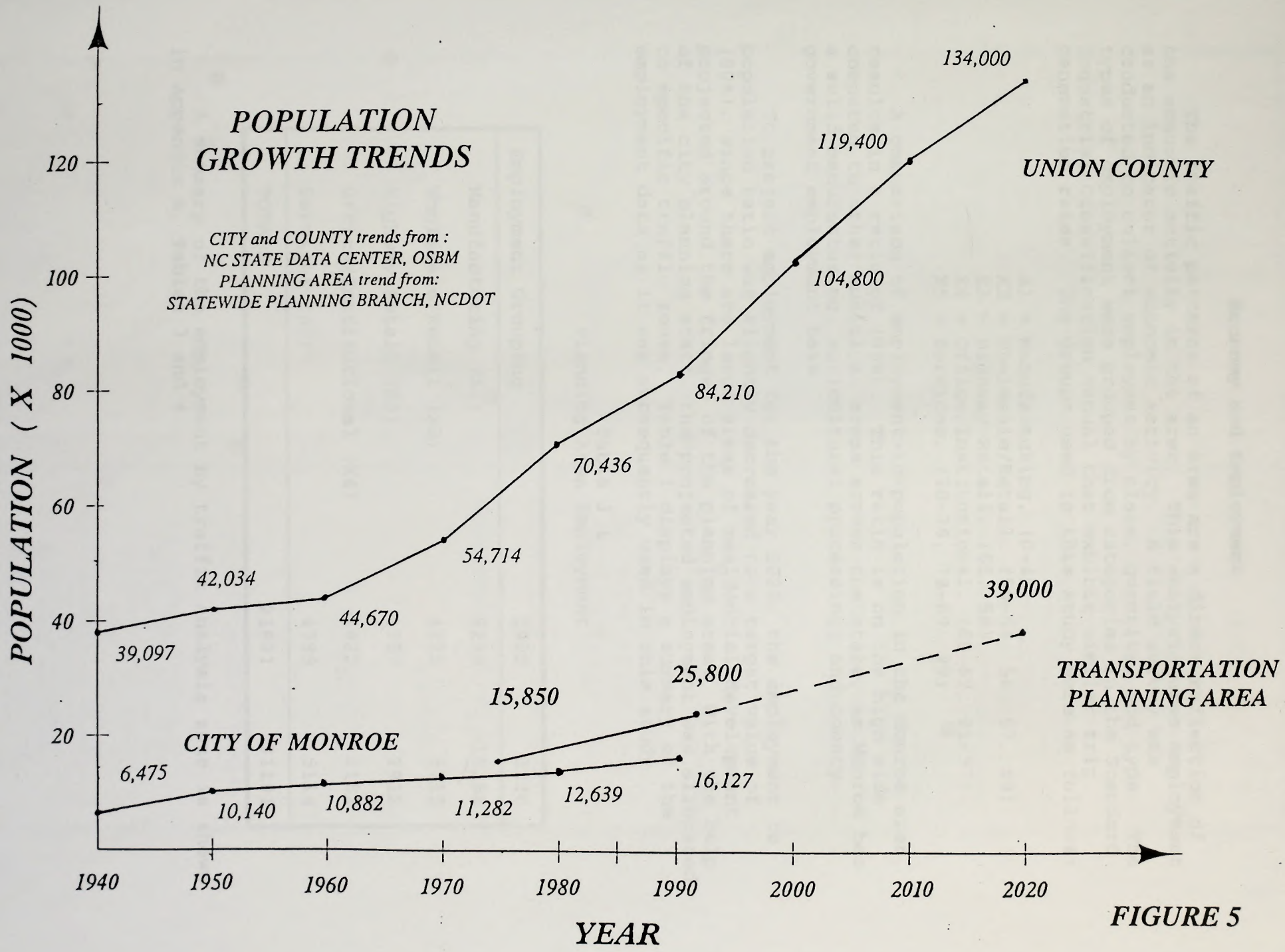
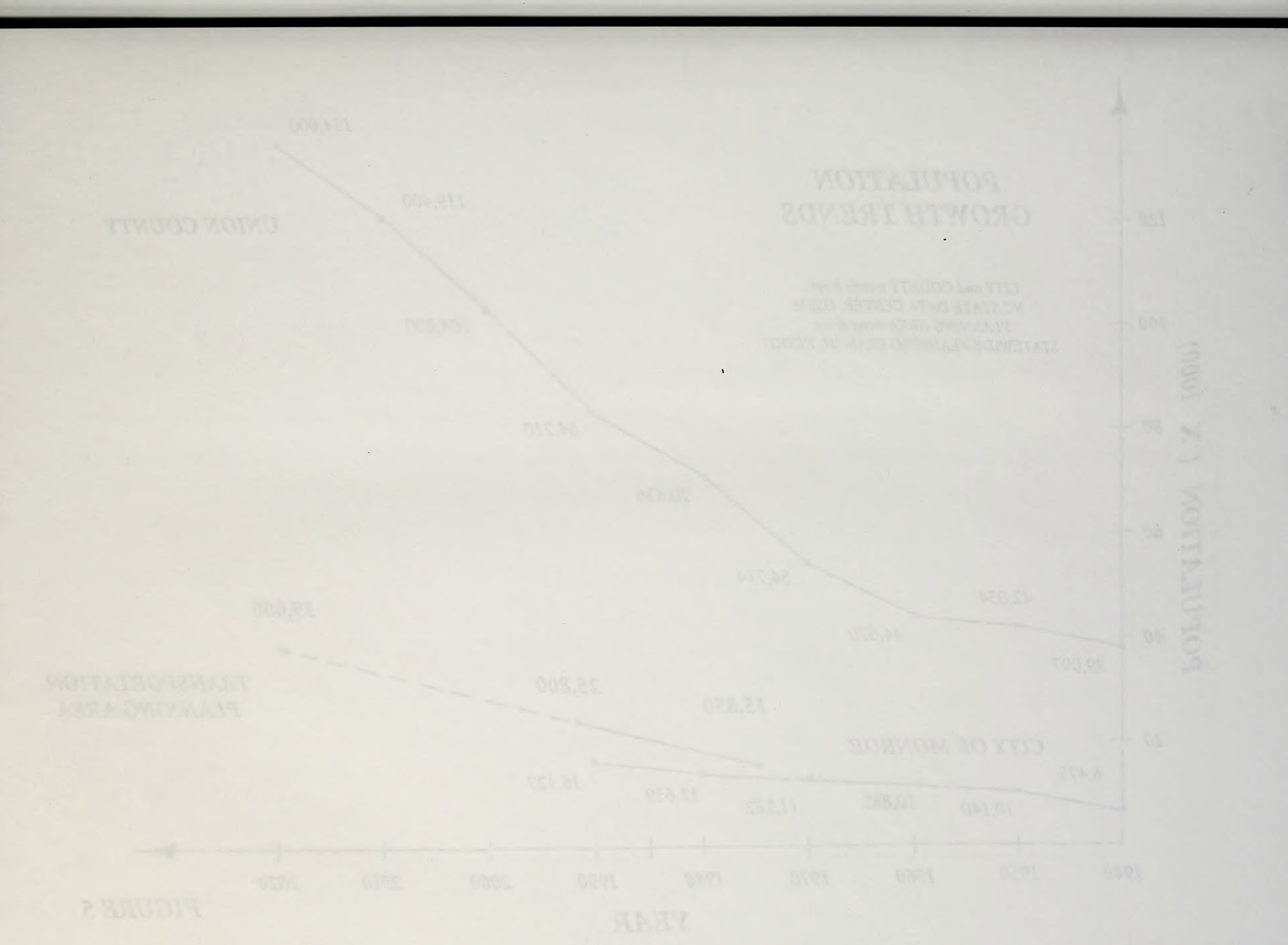

POPULATION GROWTH TRENDS
CITY and COUNTY trends from :
NC STATE DATA CENTER, OSBM
PLANNING AREA trend from:
STATEWIDE PLANNING BRANCH, NCDOT
POPULATION (X 1000)
120
100
80
60
40
20
134,000
119,400
104,800
84,210
70,436
54,714
42,034
44,670
39,097
UNION COUNTY
39,000
25,800
15,850
TRANSPORTATION PLANNING AREA
CITY OF MONROE
6,475
10,140
10,882
11,282
12,639
16,127
1940
1950
1960
1970
1980
1990
2000
2010
2020
YEAR

FIGURE 5



Economy and Employment

The traffic patterns of an area are a direct reflection of the economic activity in the area. This analysis uses employment as an indicator of economic activity. A field survey was conducted to collect employees by place, quantity, and type. The types of employment were grouped from categories in the Standard Industrial Classification Manual that exhibit similar trip generation rates. The groups used in this study were as follows:

X1 = Manufacturing, (0-49)
X2 = Wholesale/Retail, (50-54, 56, 57, 59)
X3 = Highway Retail, (55, 58)
X4 = Office/Institutional, (60-67, 91-97)
X5 = Services, (70-76, 78-89, 99)

A comparison of employment-to-population in the Monroe area results in a ratio of (85%). This ratio is on the high side compared to other municipal areas across the state, as Monroe has a solid manufacturing, agricultural processing, and county government employment base.

To project employment for the year 2020, the employment to population ratio was slightly decreased to a target value of (80%), since there are large areas of residential development projected around the fringes of the planning area. With the help of the city planning staff, the projected employment was allocated to specific traffic zones. Table 1 displays a summary of the employment data as it was subsequently used in this study.

Table 3.1
Planning Area Employment

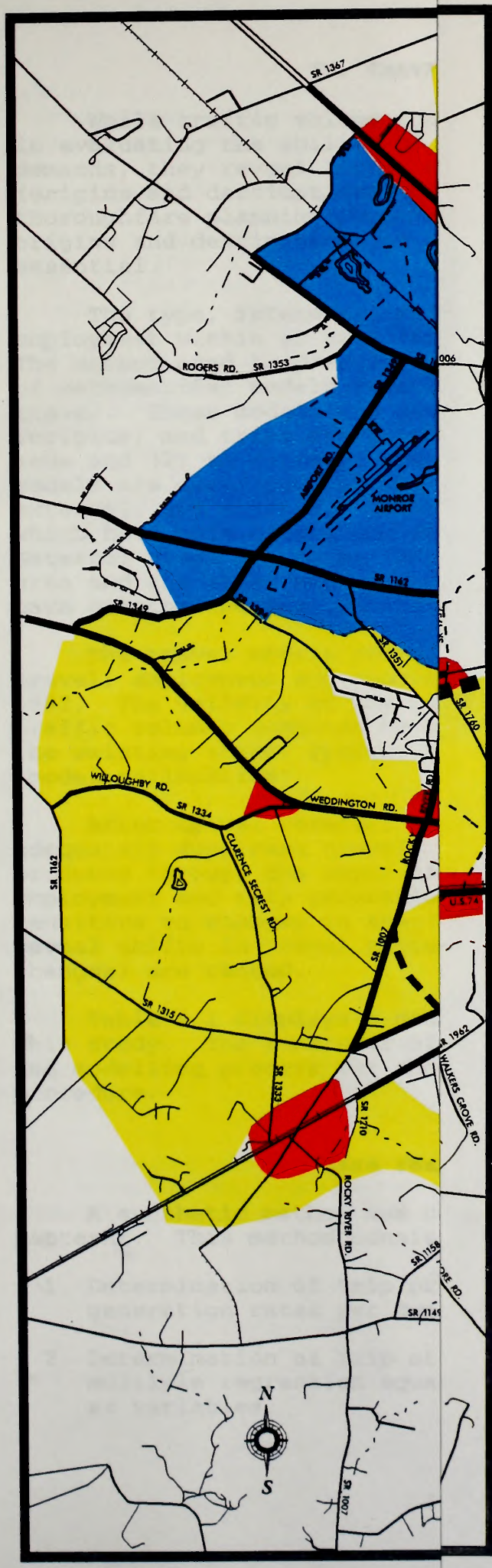
Employment Grouping	1992	2020
Manufacturing (X1)	9298	15268
Wholesale/Retail (X2)	4225	5715
Highway Retail (X3)	1757	2912
Office/Institutional (X4)	1822	2182
Services (X5)	4789	5114
TOTALS	21891	31191

A summary of the employment by traffic analysis zone is shown in Appendix A, Tables 3 and 4.

The generation of traffic on a particular street is also akin to the adjacent land uses. For example, shopping areas attract more trips than residential areas. The attraction among different land uses varies with the intensity and spatial separation of the uses.

Land use analysis was done as an integral part of the distribution of projected population and employment. The City of Monroe Planning Staff and Statewide Planning Branch determined future land use based on such factors as: existing zoning and land uses, Monroe's local development plans, topography, vacant land, utility installation plans, proposed highway projects, and practical knowledge of the area. The allocation of projected population and employment to specific traffic zones, as described previously in this chapter, was based on this land use anaysis.

The anticipated land use for the design year is shown in a generalized fashion in (Figure 6).



LEGEND

	EXISTING	PROPOSED
FREEWAY	▬▬	▬ ▬
MAJOR	▬▬	▬ ▬
MINOR	▬▬	▬ ▬
INTERCHANGE	●	◉

ADOPTED BY:

CITY OF MONROE 12-17-96

CITIZEN'S WORKSHOP 11-7-96

PUBLIC HEARING 12-3-96

RECOMMENDED BY STATEWIDE PLANNING 12-19-96

N.C. DEPARTMENT OF TRANSPORTATION 2-7-97

2020 PROJECTED GROWTH AREAS AND FUTURE LAND USE

COMMERCIAL

INDUSTRIAL

RESIDENTIAL

FIGURE 6

DECEMBER 17, 1996

THOROUGHFARE PLAN FOR MONROE

UNION COUNTY NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
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2000 0 2000 4000 6000 scale in feet

500 0 500 1000 1500 2000 scale in meters

Base Map Date
August 13, 1996

Land Use and Development

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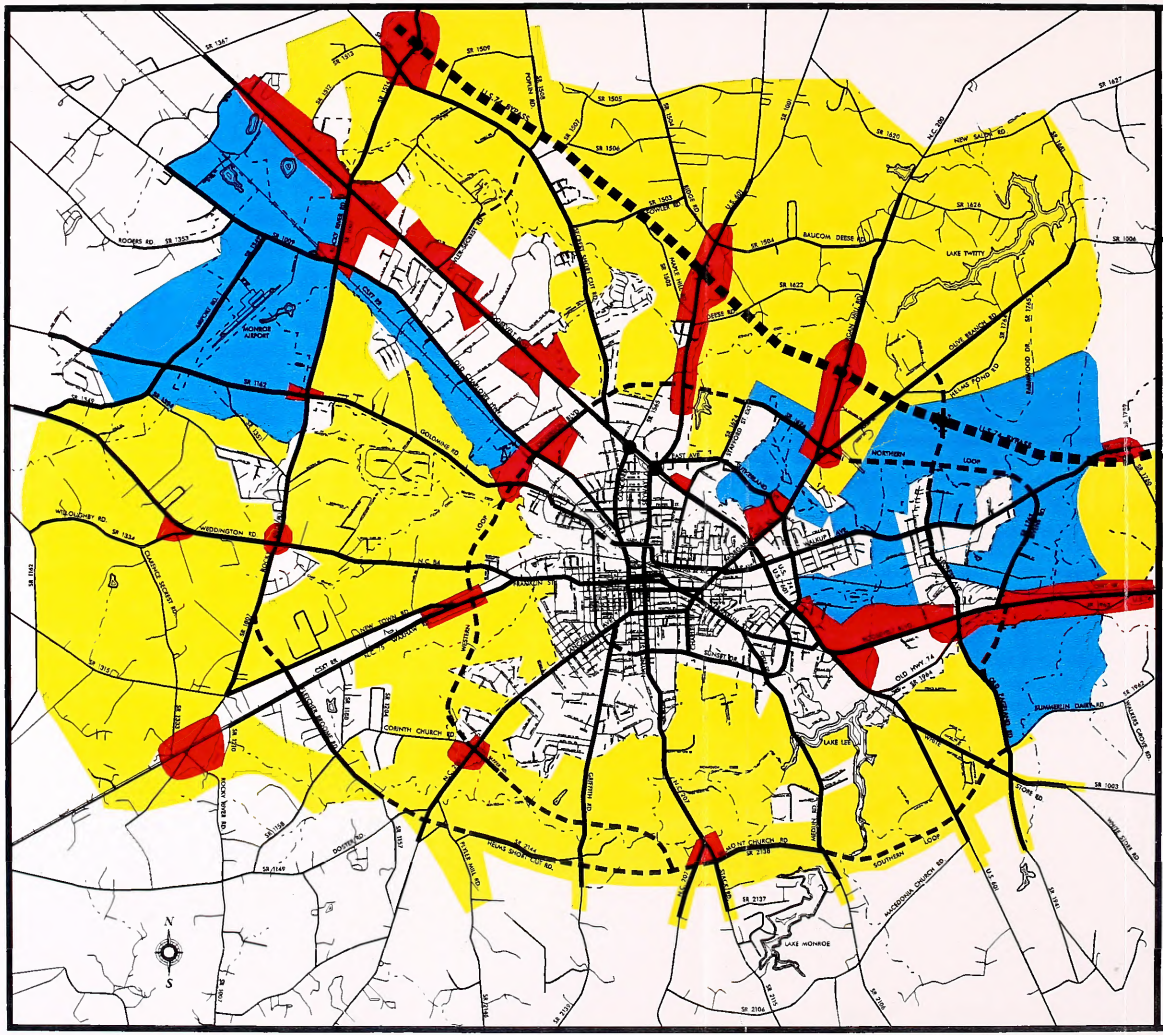

LEGEND

	EXISTING	PROPOSED
FREEWAY	━━━	━ ━ ━
MAJOR	———	– – –
MINOR	———	– – –
INTERCHANGE	●	☼

ADOPTED BY:

CITY OF MONROE 12-17-96

CITIZEN'S WORKSHOP 11-7-96

PUBLIC HEARING 12-3-96

RECOMMENDED BY STATEWIDE PLANNING 12-19-96

N.C. DEPARTMENT OF TRANSPORTATION 2-7-97

2020 PROJECTED GROWTH AREAS AND FUTURE LAND USE

COMMERCIAL

INDUSTRIAL

RESIDENTIAL

FIGURE 6

DECEMBER 17, 1996

THOROUGHFARE PLAN FOR

MONROE

UNION COUNTY NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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2000 0 2000 4000 6000
Scale in Feet

500 0 500 1000 1500 2000
Scale in Meters

Base Map Date
August 13, 1996

IV. TRAVEL FORECAST MODELS

While traffic volume counts on existing streets are useful in evaluating the ability of the current system to meet travel demands, they reveal little as to the actual travel desires (origins and destinations) of the travelling public. For thoroughfare planning purposes, a comprehensive look at the origins and destinations of existing and future travel is essential.

The type, intensity, and location of the population and employment within an area largely determine the travel patterns. The method used to predict future travel involves the development of mathematical models relating population and employment to travel. These models are developed to (1) estimate trips produced (origins) and trips attracted (destinations) by traffic analysis zone and (2) to estimate travel patterns between zones. Separate models are developed for the three basic types of trips: internal, external, and through. Internal trips are defined as those trips which have both origin and destination inside the planning area. External trips are those that have one end inside the planning area and the other end outside. Through trips are those which have origins and destinations outside the planning area.

The travel models for Monroe were developed on the basis of travel, employment and population data obtained for the base year 1992. The validity of the models was tested by comparing the traffic volumes computed by the models to traffic counts taken on the existing street system. This procedure is referred to as "model calibration".

After travel forecast models have been calibrated so they adequately duplicate travel, design year traffic estimates are produced through the input of design year data on population, employment and trip generation. The trip distribution models are sensitive to changes in the (network) street system, which will reveal shifts in travel patterns as new thoroughfares (or network changes) are tested.

Table 4.1 displays a general summary of daily trips used in this study. The remainder of Chapter IV documents the analysis and modelling process for those interested in the details of the procedure.

Base Year Travel Patterns

A synthetic method was used to estimate 1992 internal trip patterns. This method consisted of the following general steps:

1. Determination of trip productions per zone based on trip generation rates per dwelling unit.

2. Determination of trip attraction factors per zone based on a multiple regression equation procedure that uses employment as variables.

3. Trip distribution by a three purpose gravity model using trip length frequency curves.

4. Traffic assignments to the existing network and accuracy checks of the procedures and results.

Table 4.1 Daily Trip Summary

Trip Type	1992	2020
Average Trips/DU	7.5	8.6
Internal Trips	90,389	182,398
Home Based Work	13,462	25,207
Home Based Other	31,818	59,501
Non-Home Based	15,909	29,790
NHB Secondary	29,200	67,900
External Trips	86,271	192,622
Through Trips	33,695	54,964
TOTAL DAILY TRIPS	210,355	429,984

Internal Trip Productions

Average daily trip productions were estimated on a zonal basis in three categories: (1) trips produced by dwelling units, (2) trips produced by trucks, and (3) trips produced by commercial passenger vehicles.

(1) Trips produced by dwelling units were computed by multiplying the appropriate trip genreration rate by the number of dwelling units in each zone. For each category of dwelling unit (excellent, above average, average, below average, or low income) a different generation rate was used. These rates are a composite from a literature search of similiar study areas in North Carolina and rates used in the previous Monroe study. They are validated in the model calibration process. These trip generation rates are summarized in Table 4.2 shown below.

(2),(3) Trip generation rates for trucks and commercial vehicles have also been taken from literature and in-house experience with many other studies that reveal a statewide urban average of 6.7 trips per day.

Dwelling unit and commercial vehicle information, by zone, is contained in Appendix A, Table 1.

Internal-internal (zonal) trip productions were then divided into the three trip purposes: home based work trips (HBW), home based other trips (HBO), and non-home based trips (NHB). The percentages used were: HBW = 22%, HBO = 52%, and NHB = 26%.

The remaining component of internal trips are "secondary" trips; that is, NHB trips produced by vehicles garaged outside the planning area but having both trips ends within the planning area. Using current planning guidelines, it is assumed that 40%-50% of these externally garaged vehicles make secondary trips while in the planning area. During calibration, this value was determined to be 40% for the Monroe area, which produces additional 29,200 trips. These trips are added to the previously calculated NHB internal trips and distributed to the traffic zones based on the trip attraction factors for NHB trips.

The final generation rates used for internal trip productions are shown in the following table.

Table 4.2
1992 & 2020 Trip Generation Rates

Housing Classification	1992	2020
Excellent	12.0	13.0
Above Average	10.0	11.0
Average	8.0	9.0
Below Average	7.0	8.0
Low Income	4.0	5.0

Trip Attractions

Attraction factors for the various zones in the study area are directly related to employment characteristics in these zones. HBW trip attraction factors are based on total employment. HBO and NHB trip attraction factors were based on employment groupings in each zone. These employment figures were used as the independent variable in a multiple regression analysis. The dependent variable consisted of the external-internal trip ends inside the planning area. The employment statistics are shown in Appendix A, Tables 3 and 4.

The regression equations for internal trips resulting from the previous analysis are as follows:

HBW: $Y = 1.00X1 + 1.00X2 + 1.00X3 + 1.00X4 + 1.00X5$

HBO: $Y = 0.20X1 + 5.20X2 + 8.60X3 + 3.50X4 + 3.10X5$

NHB: $Y = 0.40X1 + 5.20X2 + 8.60X3 + 3.50X4 + 3.10X5$

EXT-INT: $Y = 1.00X1 + 2.00X2 + 8.60X3 + 3.50X4 + 3.10X5$

Where: Y = Attraction factor for each zone
X1 = Manufacturing (SIC 0-49)
X2 = Wholesale/Retail (SIC 50-54,56-57,59)
X3 = Highway Retail (SIC 55,58)
X4 = Office/Institutional (SIC 60-67,91-97)
X5 = Services (SIC 70-76,78-89,99)

Notes: SIC = codes from the Standard Industrial Classification Manual,-1972.

The coefficients used in these equations are from standard equations developed in the Statewide Planning Branch over the past 30+ years of urban thoroughfare studies. The zonal attraction factors thus derived were adjusted so that the total attractions equalled the total productions(which are deemed the more accurate estimates). This adjustment was done by multiplying each zonal attraction factor by the ratio of total productions to total unadjusted attractions for each trip category. The resulting productions and attractions were then input into the gravity model for the trip distribution phase.

Trip Distribution

The gravity model trip distribution program was used to distribute internal trips. Input to this program included: (1) zone-to-zone travel times obtained from a "traffic paths" computer simulation using the existing 1992 street network, (2) individual zonal trip productions and attractions, and (3) trip length frequency curves obtained from the previous Monroe study and adjusted for slightly longer travel times of a larger study area of today.

Base Year External and Through Trips

Traffic counts were taken at 33 locations (stations) around the cordon where routes enter the planning area. These counts were used to adjust the external and through trip tables from the 1974 study in which an origin and destination survey was conducted. There were also adjustments made to allow for the additional planning area and accompanying stations added on the western side of the study area. The resulting trip data is shown in Appendix A, Table 5.

Trip Assignment

Trips were assigned to the network using an all or nothing loading with the UAG Tranplan computer package. This loading was also used in the 2020 design year. This loading method does not take into account capacity limitations on competing routes, therefore, some manual adjustments were made for a more logical network loading.

Accuracy Checks

The model's ability to simulate travel patterns in the area was checked by a comparison of assigned traffic to actual counts taken by the North Carolina Department of Transportation. This is done by the use of "screenlines" that dissect the area. The modelled traffic versus the actual counts are compared to determine if the model is producing the correct magnitude of trips on the network. Two screenlines were set up for the area and are shown in as part of the zone boundary configuration on the map in Figure 3. The final results of the screenline calibration is shown on the next page.

Screenline	Model's Count	Actual ADT's	Percentage
A	84,916	86,300	98
B	118,126	121,590	97

In addition to screenline checks, link comparisons were made on most of the network. The results of these two accuracy checks were considered to be within the acceptable limits for the purposes of long range transportation planning.

2020 DESIGN YEAR TRAVEL PATTERNS

Internal Trips

These travel patterns were estimated by projecting the socio-economic data to the year 2020, and then using the 1992 internal travel development procedures to estimate the 2020 travel. The City of Monroe concurred with the projections of housing and employment by zone for the design year.

Dwelling unit trip generation rates were determined for 2020 by increasing the 1992 rates uniformly by an amount related to the expected growth in auto ownership within the area and decreases in dwelling unit occupancy rates. Trends for vehicle ownership (see Figure 7) and occupants per dwelling unit (see Figure 4) are the basis for increasing the trip generation rates in the design year. These computations are shown below.

$$\frac{\text{1992 pop/veh}}{\text{2020 pop/veh}} \times \frac{\text{2020 pop/du}}{\text{1992 pop/du}} = \text{RATE INCREASE}$$

$$\frac{1.22}{1.10} \times \frac{2.50}{2.69} = 1.0$$

where: pop = population
veh = vehicle registrations
du = dwelling units

These new trip generation rates were applied to the projected 2020 dwelling units. The 2020 trip generation rates for trucks and commercially owned passenger cars was assumed to remain at 6.7 trips per vehicle. It was assumed that the ratio of these vehicles to employment would remain constant in each zone throughout the planning period. Based on projected employment in the area, the

truck and commercial vehicle estimate will increase from 1992 to 2020 as shown below.

Trucks:	1992 = 1630	2020 = 1770
Commercial Autos:	1992 = 699	2020 = 826

The percentage breakdown of internal trips by purpose was assumed to remain constant over the planning period. Additionally, the non-home-based secondary trips were held steady at 40 % of the external trip total.

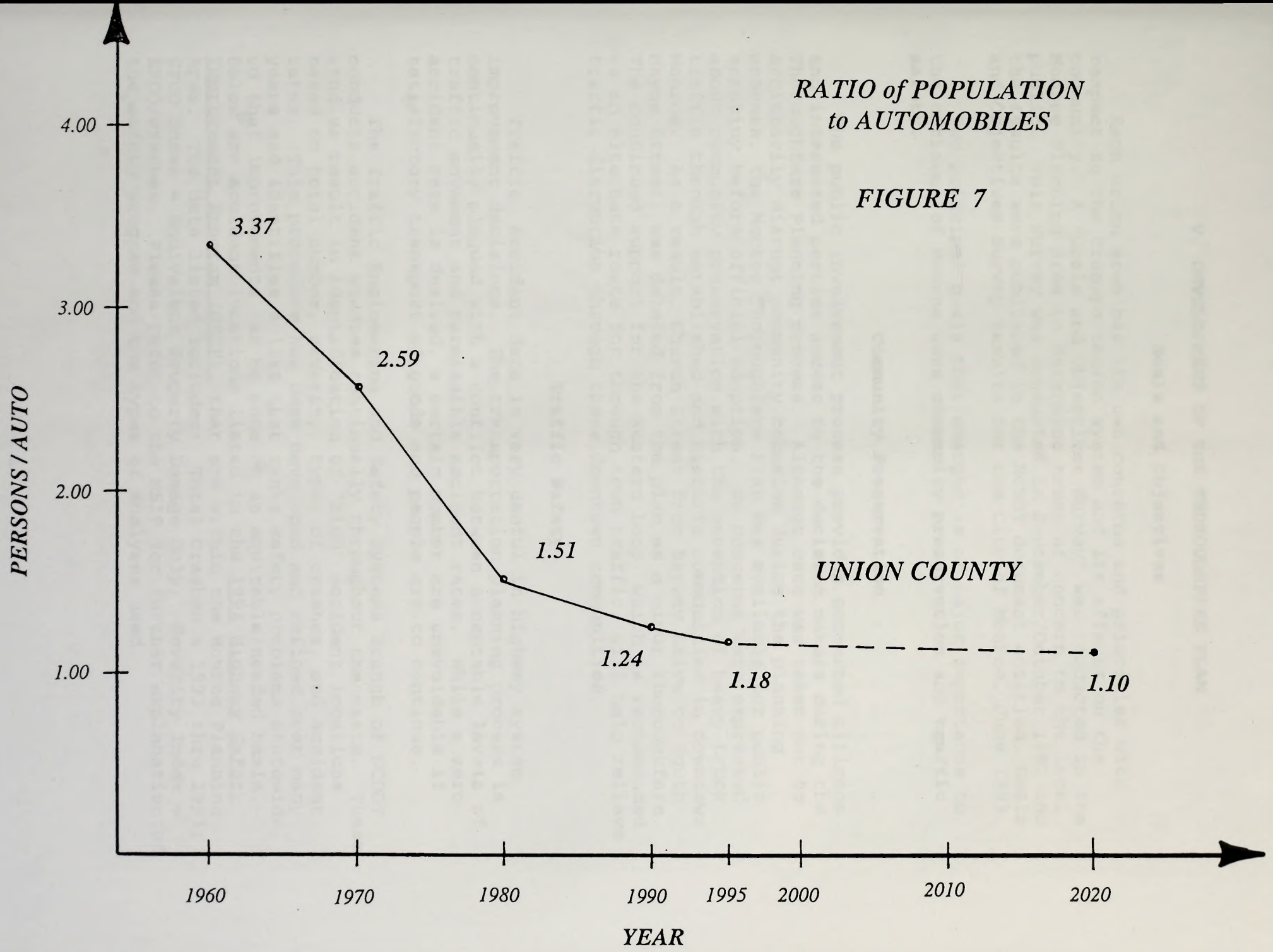
Trip attraction factors for HBW trips were taken as the total projected 2020 employment by zone. Trip attraction factors for HBO and NHB purposes were determined by using the 1992 regression equations with projected 2020 zonal employment and dwelling unit data. The distribution of 2020 employment and housing was based land development plans, zoning, topography, vacant land and the city planning staff's knowledge of the area. A complete listing of socio-economic data is shown in Appendix A.

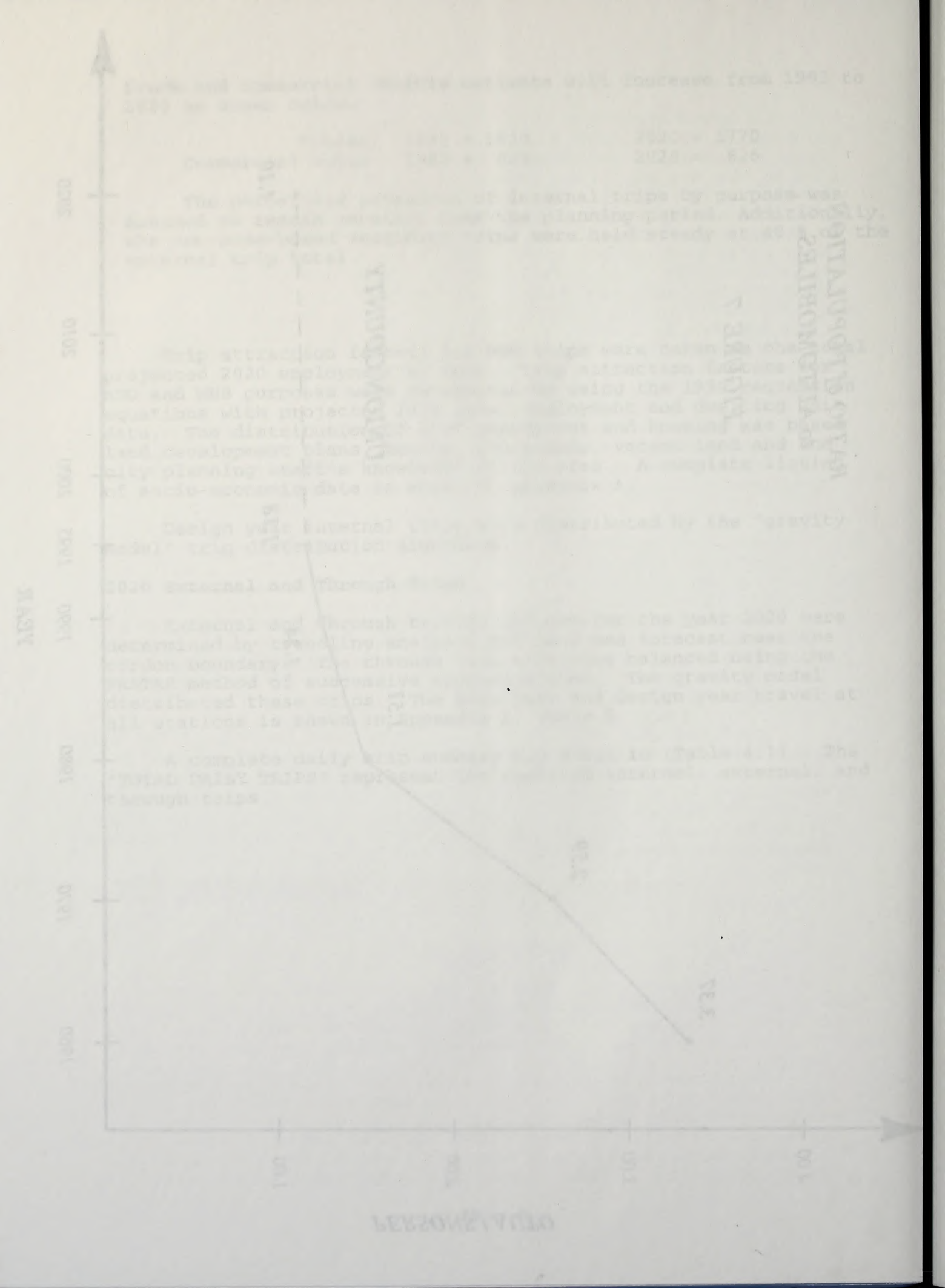
Design year internal trips were distributed by the "gravity model" trip distribution algorithm.

2020 External and Through Trips

External and through traffic volumes for the year 2020 were determined by trendline analysis and land use forecast near the cordon boundary. The through trip ends were balanced using the FRATAR method of successive approximations. The gravity model distributed these trips. The base year and design year travel at all stations is shown in Appendix A, Table 5.

A complete daily trip summary was shown in (Table 4.1). The "TOTAL DAILY TRIPS" represent the combined internal, external, and through trips.


RATIO of POPULATION
to AUTOMOBILES
FIGURE 7
4.00
3.00
2.00
1.00
PERSONS / AUTO
3.37
2.59
1.51
1.24
1.18
1.10
UNION COUNTY
1960
1970
1980
1990
1995
2000
2010
2020
YEAR



V. DEVELOPMENT OF THE THOROUGHFARE PLAN

Goals and Objectives

Each urban area has its own concerns and priorities with respect to the transportation system and its effects on the community. A "Goals and Objectives Survey" was conducted in the Monroe Planning Area to determine areas of concern to the local public. This Survey was conducted in September/October 1992 and the results were published in the NCDOT document entitled, Goals and Objectives Survey Results for the City of Monroe, June 1993.

Two principal goals that emerged as of major importance to the citizens of Monroe were **community preservation** and **traffic safety.**

Community Preservation

The public involvement process provides concerned citizens and interested parties access to the decision makers during the Thoroughfare Planning process. Although care was taken not to arbitrarily disrupt community cohesion during the planning process, the Monroe Thoroughfare Plan was available for public scrutiny before official adoption. No concerns were expressed about community preservation with the exception of heavy truck traffic through established and historic communities in downtown Monroe. As a result, Church Street from Skyway Drive to South Hayne Street, was deleted from the plan as a minor thoroughfare. The continued support for the Western Loop, which is recommended as an alternate route for through town traffic, will help relieve traffic disruption through these downtown communities.

Traffic Safety

Traffic accident data is very useful in highway system improvement decisions. The transportation planning process is continually plagued with a conflict between acceptable levels of traffic movement and permissible accident rates. While a zero accident rate is desired, a certain number are unavoidable if satisfactory transport of goods and people are to continue.

The Traffic Engineering and Safety Systems Branch of NCDOT conducts accident studies continually throughout the state. These studies result in identification of "high" accident locations based on total number, severity, types of crashes, and accident rates. This procedure has been developed and refined over many years and identifies a list that ranks safety problems statewide, so that improvements can be made on an equitable/needed basis. Below are accident locations listed in the 1996 Highway Safety Improvement Program (HSIP), that are within the Monroe Planning Area. The data listed includes: Total Crashes = 1993 thru 1995; EPDO Index = Equivalent Property Damage Only; Severity Index = EPDO/crashes. Please refer to the HSIP for further explanation of the safety program and the types of analyses used.

Accident Locations	Total Crashes	EPDO Index	Severity Index
US 74 @ Chambers Drive (SR 2356)	14	195.2	13.94
Church Street @ Jefferson Street	10	115.4	11.54
Sutherland Avenue @ Walkup Avenue	11	116.4	10.58
Concord Avenue @ Phifer Street	10	100.6	10.06
Concord Avenue @ Secrest Short Cut Road	12	110.0	9.17
Phifer Street @ Miller Street	11	40.6	3.69
Sunset Drive @ Franklin Street	14	51.0	3.64
Dickerson Boulevard @ Commerce Drive	17	61.4	3.61
Rocky River Road @ Secrest Short Cut Road	17	61.4	3.61
Morgan Mill Road @ Windsor Street	12	41.6	3.47
Charlotte Avenue @ Allen Street	19	63.4	3.34
US 74 @ Rocky River Road	38	126.8	3.34
Skyway Drive @ Phifer Street	23	67.4	2.93
Skyway Drive @ East Avenue	11	25.8	2.35
Hayne Street @ Jefferson Street	12	26.8	2.23

Capacity Deficiency Analysis

An indication of the adequacy of the existing major street system is a comparison of the traffic volumes versus the ability of the streets to move traffic freely at a desirable speed. In an urban area, a street's ability to move traffic is usually controlled by spacing of major intersections, width of pavement, and the signalization used.

Capacity is the maximum number of vehicles which has a "reasonable expectation" of passing over a given section of a roadway, during a given time period under prevailing conditions. The relationship of traffic volumes to the capacity of the roadway will determine the level of service (LOS). A brief description of each level of service based on the 1994 Highway Capacity Manual follows this paragraph. Figure 8 depicts the levels of congestion associated with the corresponding level of service.

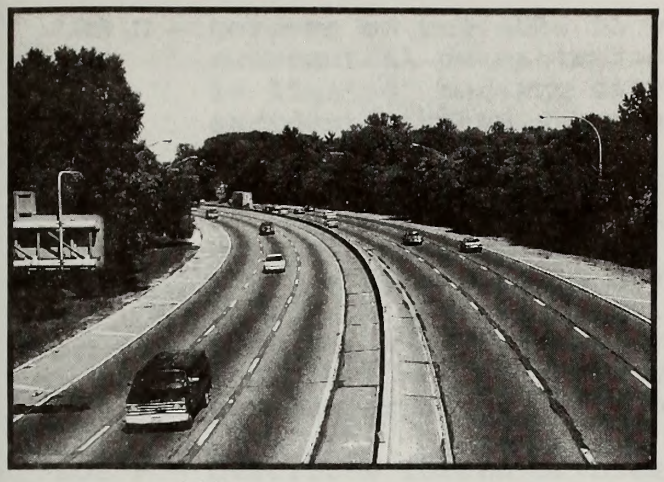
Levels of Service

LOS A - describes primarily free flow conditions. The motorist experiences a high level of physical and psychological comfort. The effects of minor incidents or breakdowns are easily absorbed. Freedom to select desired speeds and maneuver within the traffic stream is very high.

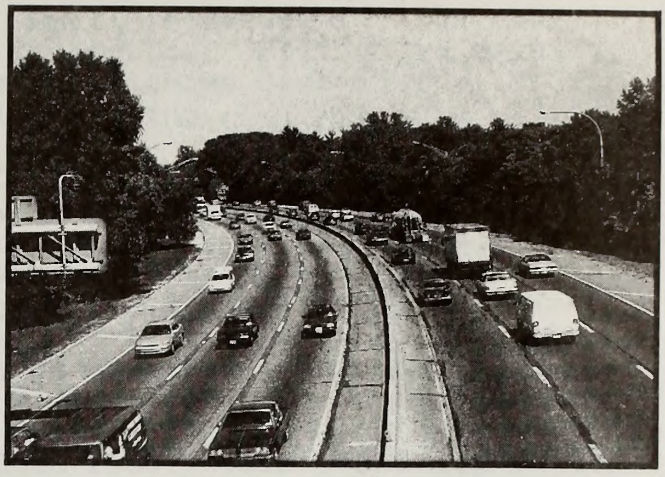
LOS B - also represents reasonably free flow conditions. The ability to maneuver within the traffic stream is only slightly restricted.

LOS C - provides for stable operations, but flows approach the range in which small increases will cause visible deterioration in service. Freedom to maneuver is noticeably restricted. Minor incidents may still be absorbed, but the local decline in service will be great. Queues may be expected to form behind any significant blockage.

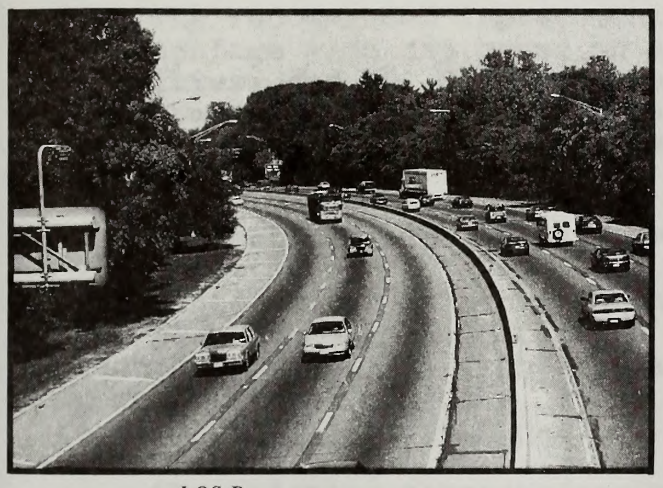
Source: 1994 Highway Capacity Manual



LOS A.

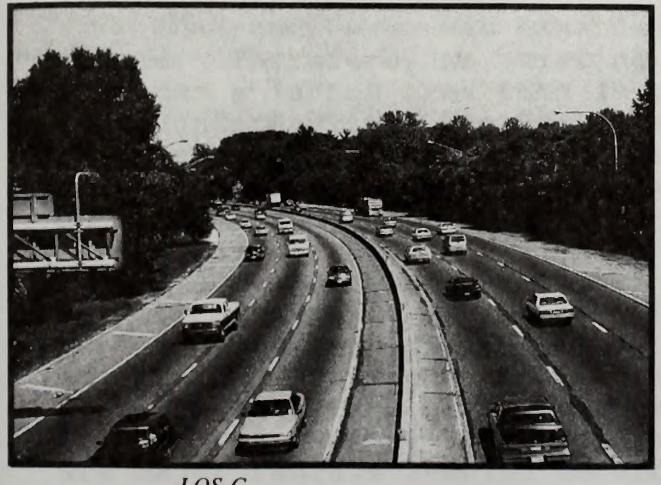


LOS D.

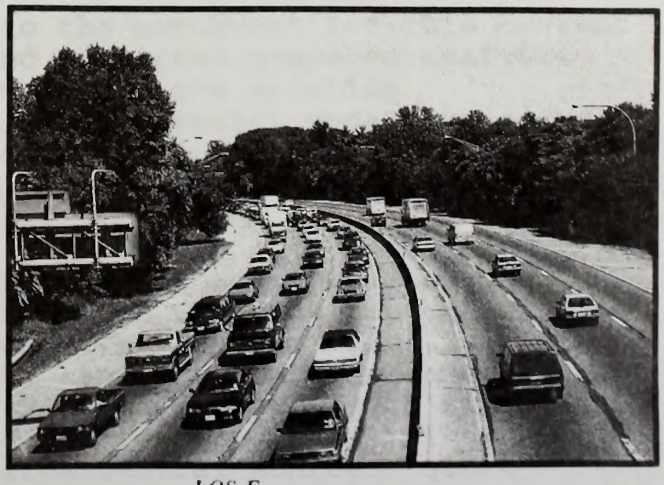


LOS B.

LOS E.



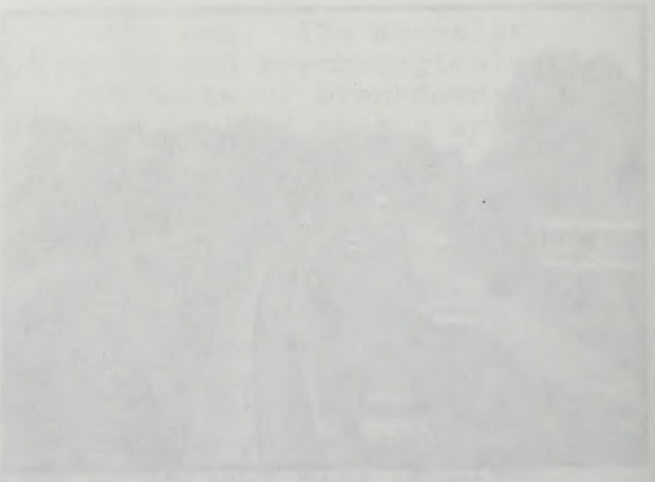
LOS C.



LOS F.

LEVELS OF SERVICE

FIGURE 8



LOS D - borders on unstable flow. Small increases in flow cause substantial deterioration in service. Freedom to maneuver is limited, and the driver experiences discomfort. Minor incidents create substantial queuing.

LOS E - the boundary between LOS D and LOS E describes operation at capacity. Traffic flow at this level is extremely unstable, because there are virtually no usable gaps in the traffic stream. Any disruption to the traffic stream, such as a vehicle entering from a ramp, or changing lanes, requires the following vehicles to give way to admit the vehicle. Any incident can be expected to produce a serious breakdown in flow with extensive queuing.

LOS F - describes forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point, which results in queues forming. Intersection congestion is likely at signalized locations, with long delays at approaches.

The recommended improvements and overall design of the Thoroughfare Plan are based on achieving a LOS D on existing facilities, and LOS C on proposed facilities. LOS D is considered the "practical capacity" of a facility, or that at which the motoring public begins to express dissatisfaction with the level of congestion.

Existing Thoroughfare Plan and Committed Projects

Since Monroe has an existing thoroughfare plan, a test of this plan was done to determine if it is still adequate for the planning area. If growth forecasts were accurate during the last thoroughfare plan update, a new recommended plan should not require wholesale revisions.

The existing thoroughfare plan was mutually adopted in 1980. A revision to the plan was mutually adopted in 1989. This revision pushed the US 74 Bypass northward and added the Northern Loop between the bypass and existing US 74 (Roosevelt Boulevard). Also added were extensions to Secrest Avenue and Stafford Street.

The study area was expanded to the northwest for this current update. Therefore, an existing and committed projects analysis includes a larger area than is covered by the existing thoroughfare plan. The 2020 design year gravity model projected volumes were assigned to the existing and committed network and a system capacity analysis was used to determine the anticipated deficiencies.

Figure 9 shows the streets that are expected to develop "practical capacity" problems when loaded with the projected 2020 design year volumes even if the committed (programmed) improvements from the thoroughfare plan were to be implemented. With the exception of Rocky River Road and a section of Sutherland Avenue, the capacity deficiencies that resulted from this analysis are major radials leading to and from central Monroe. Since deficiencies still exist, the next step is to analyze the results of implementing the entire existing plan.

The proposed "loop system" and short connectors on the thoroughfare plan provide for system solutions to most of these capacity deficiencies. Widening of existing routes solves other remaining deficiencies and leaves only designating routes into the expanded planning area. The recommended thoroughfare plan requires only the following additions to accomodate the anticipated 2020 design year traffic patterns.

- extension of existing thoroughfares into expanded planning area to the northwest
- connector from Bivens Road to Old Pageland Road
- connector from Southern Loop to Rocky River Road
- addition of Airport Road and Rocky River Road as major thoroughfares
- extension into expanded planning area, Roosevelt Boulevard, Old Charlotte Highway, Goldmine Road, Weddington Road, New Towne Road, Waxhaw Road, Secrest Short Cut Road as major thoroughfares
- addition of Baucom Deese Road, Fowler Road, Fowler-Secrest Road, Johnson Street, Poplin Road, Ridge Road, Rogers Road, and Willoughby Road as minor thoroughfares

Analysis has indicated that most problem areas can be improved with widening and the addition of turning lanes at major intersections. The overall thoroughfare plan does not exhibit any major system deficiencies. Hopefully, this is due to the fact that Monroe and NCDOT have been cooperatively doing thoroughfare planning in this area since 1959. This has led to a street system in Monroe that is well developed on the basic principles of thoroughfare planning.

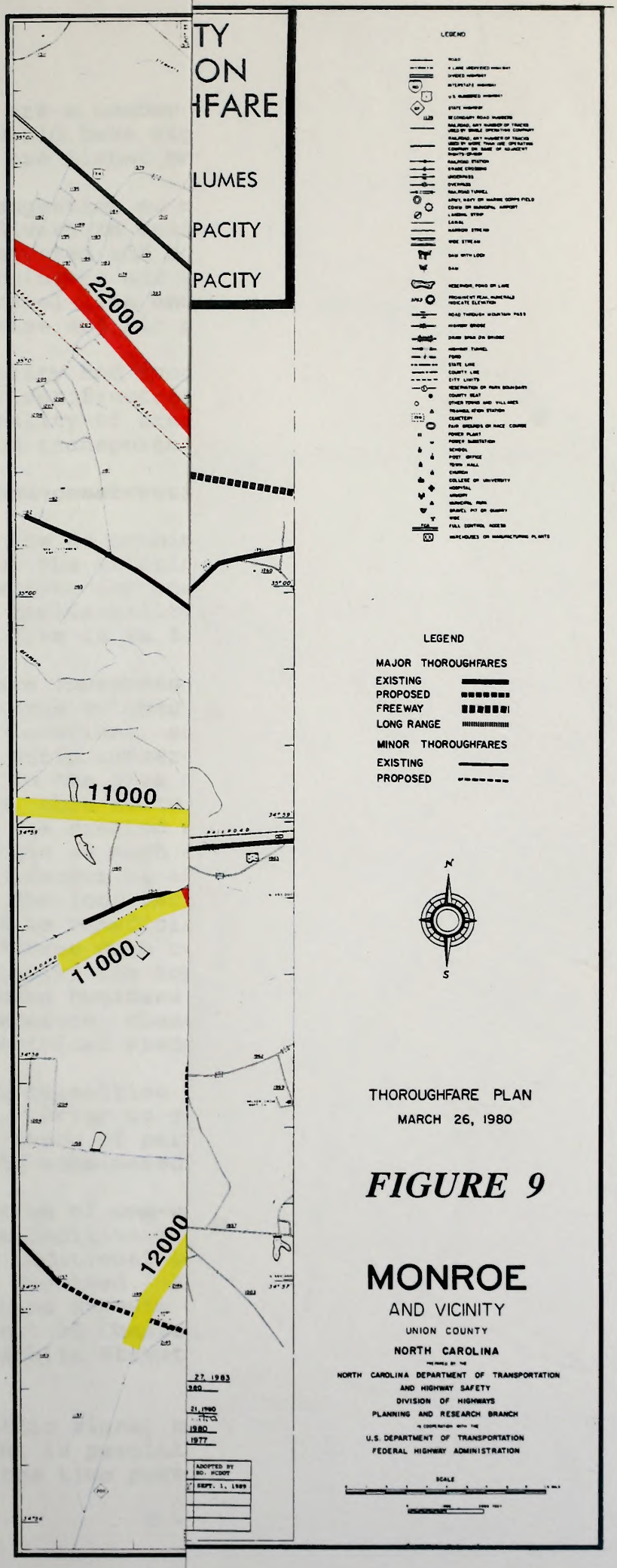
Alternative Plan Analyses

The process of developing, testing and evaluating alternate plans involved a number of considerations. These included area goals and objectives, identified capacity and system deficiencies, environmental impacts, and anticipated land development. Travel forecasts provide a basis for evaluation of alternatives as to ability to serve future travel desires. Aerial photography, topographic mapping, field reconnaissance, cooperation with the City staff, input from citizen and organizational groups, and guidance from the Planning Board and City Council provided other basis' for plan evaluation.

Do Nothing Alternative

A "do nothing" alternative was considered in weighing the desirability of developing a thoroughfare plan. This plan is essentially as the name implies, there are no construction improvements to the system. Regular maintenance would still be performed. Some of the major advantages of the "do nothing alternative" are:

1. No additional capital investment
2. No additional construction disruption
3. No additional land acquisition
4. No additional displacement of people or property
5. No new environmental damage caused by construction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PROPOSED
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LONG RANGE
MINOR THOROUGHFARES
EXISTING
PROPOSED
N
S
THOROUGHFARE PLAN
MARCH 26, 1980
FIGURE 9
MONROE
AND VICINITY
UNION COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
AND HIGHWAY SAFETY
DIVISION OF HIGHWAYS
PLANNING AND RESEARCH BRANCH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALE
ADOPTED BY
BD. HCDOT
SEPT. 1, 1989

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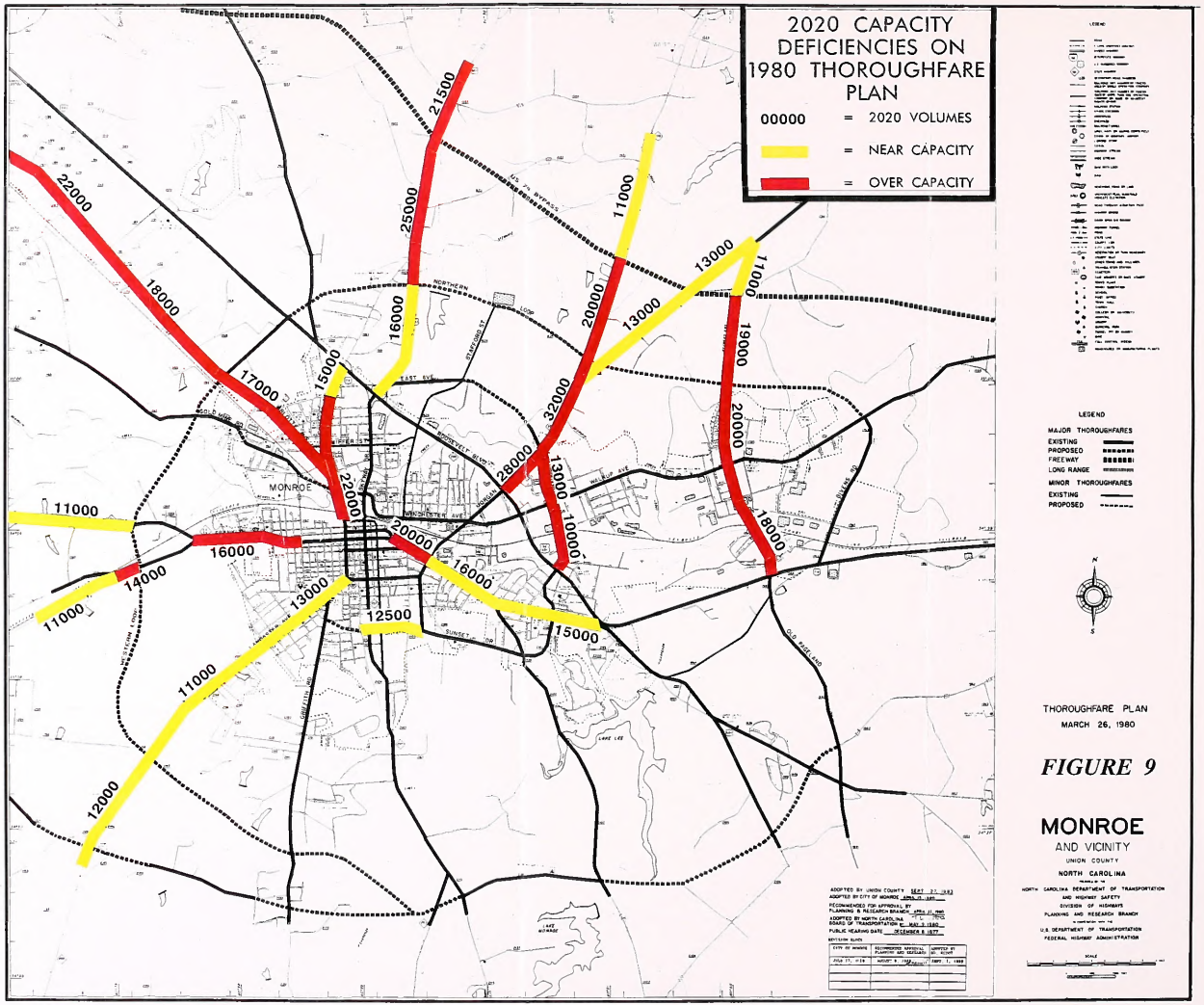
2020 CAPACITY DEFICIENCIES ON 1980 THOROUGHFARE PLAN
00000 = 2020 VOLUMES
= NEAR CAPACITY
= OVER CAPACITY
LEGEND
MAJOR THOROUGHFARES
EXISTING
PROPOSED
FREEWAY
LONG RANGE
MINOR THOROUGHFARES
EXISTING
PROPOSED
THOROUGHFARE PLAN
MARCH 26, 1980
FIGURE 9
MONROE
AND VICINITY
UNION COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
AND HIGHWAY SAFETY
DIVISION OF HIGHWAYS
PLANNING AND RESEARCH BRANCH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
MONROE
22000
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18000
10000

However, there are a number of disadvantages to a "do nothing alternative" which would have significant effects on the urban environment. A few are listed below:

1. Increased congestion on major thoroughfares will cause traffic to divert to residential and local streets
2. Existing congested and bottleneck situations will worsen
3. Increased accidents and safety problems
4. Increased travel time and road user costs
5. Increased noise and air pollution resulting from traffic congestion
6. Reduced mobility and longer routes for emergency vehicles
7. Increased driver frustration due to traffic congestion
8. Economic vitality of area may suffer due to traffic congestion on transportation system

Non-construction Alternatives

In addition to the do nothing plan, it is desirable to take a more in depth look at the existing street system to determine if non-construction projects can enable the existing system to serve future travel. The applicability of non-construction projects to the Monroe Planning Area is as follows:

- **Control of access** increases capacity where highway capacity is reduced by large volumes of turning traffic at many closely spaced locations, such as on an arterial that has developed in a strip commercial pattern. The best example of this situation in the area is Roosevelt Boulevard. At time of construction, this route was called a bypass. But lack of access control has created a heavily congested route that serves land access as much as through traffic movement. Other routes in danger of this development pattern are Rocky River Road and the loop facilities, especially the Western Loop. It would be beneficial to attempt to reduce or limit the number of future curb cuts as the routes continue to develop. Generally, the topic of access control initiates a tug of war between business interests and transportation interests. Therefore, these recommendations are usually decided in a political arena.

- Existing street capacities can be improved by removing on-street parking. Prior to removal of **on-street parking,** the excess or deficiency of parking in the immediate area affected must be considered.

- The implementation of **one-way streets** can increase the capacity of the facilities by up to 50 percent. One-way pairs have the additional benefit of increasing the safety of the facilities involved. As an example, the Franklin/Jefferson Streets one-way pair could be extended for a few blocks west of Charlotte Avenue to increase the capacity of Franklin Street, with minimum construction requirements.

- Prior to a traffic signal being installed on a facility, the through movement is permitted continuously. Upon signal installation, the time permitted for the through movement is

significantly reduced to allow for conflicting movements, possibly by as much as fifty percent. This results in a reduced capacity for the primary facility. Therefore it is important that signals only be installed as an absolute last resort, and with consideration to the overall impact on the facility. A **collector street plan** can reduce the number of future traffic signals that will be required, and provide for coordination of existing and future traffic signals that will allow for more efficient signal timing plans.

- An aggressive **carpool, vanpool,** or **public transit** program could process the same number of person-trips while decreasing the number of vehicle-trips and thus decrease congestion. Currently the Monroe area does not have an historical vehicle occupancy data to analyze for evaluation of the possible benefits of such a program.

- Altering work hours **(flex-time)** such that the beginning and ending times are staggered, can reduce travel in the peak hour. The resulting peak period would be less congested, but last longer. Therefore, the total traffic carrying ability of an existing street can be increased with no capital outlay for street improvements. The peak hour pattern of traffic demand has the greatest negative impact on existing street capacity than any other single factor. The reduction of peak hour traffic would also reduce demand on utilities, emergency response units, and relieve stress on the general public.

- **restrictions on growth** would also slow traffic growth, and delay the need for street improvements. This approach, however, would adversely affect the economy of the planning area. A much better approach is to coordinate growth with a progressive system of transportation improvements that anticipate increases in travel desires.

These non-construction alternatives will improve operation on the existing system, but they alone cannot accommodate the long term traffic growth in the area. The do nothing concept, while an alternative, is not a viable alternative in transportation planning for the Monroe area because of the overwhelming disadvantages.

VI. ENVIRONMENTAL CONCERNS

In the past several years, environmental considerations associated with highway construction have come to the forefront of the planning process. The legislation that dictates the necessary procedures regarding environmental impacts is the National Environmental Policy Act. Section 102 of this act requires the execution of an environmental impact statement, or EIS, for road projects that have a significant impact on the environment. Included in the EIS are the project's impacts on the physical, social and cultural, and economic environment.

At this early system planning stage, only preliminary research is done in these areas. But this overview can identify areas that could be problammatic before resources are committed at more detailed planning and design stages of project development.

Air Quality

Air quality has been a concern in the planning and construction of roads as early as the Federal Air Pollution Control Act of 1955. This concern continued with the passing of the Clean Air Act of 1970 which set standards on pollution control. This Act was later amended in 1977 and more recently in 1990. The 1990 amendment set more stringent standards on mobile source emissions which impacted transportation planning by requiring transportation related provisions. These provisions promote integration of air quality analyses with the transportation planning process; requirements for determining conformity of transportation plans, programs, and projects; expanded use of highway sanctions; and a renewed emphasis on controlling growth in vehicle-miles-travelled (VMT) and reducing congestion levels. In addition, the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 states further integration between State and local transportation planning is needed for conformity with the Clean Air Act.

When mobile source emissions exceed acceptable levels then the area is considered a nonattainment area. These areas must meet deadlines in reducing standard emissions levels. Even though Federal law focuses on these nonattainment areas, the attainment areas are also important and should be aimed at remaining classified as such. Monroe is an attainment area for all pollutants targeted in the 1990 Clean Air Act. Therefore, a conformity analysis with the Clean Air Act is not required for Monroe and this material is being presented for information only.

The design of a thoroughfare plan can have a significant effect upon the type and quantity of motor vehicle pollutants released into the atmosphere. In general, emissions are reduced when traffic is permitted to flow smoothly and congestion is reduced which achieves a more efficient use of fuel. Therefore, a

well designed street network aims at reducing congestion and allowing free flow travel. A street system that provides direct movement between sections of the City reduces travel time and distances, subsequently reducing pollutant emissions. The Monroe Thoroughfare Plan promotes free flowing travel and reduces congestion which both have a positive effect on maintaining acceptable levels of emissions.

Wetlands

Wetlands are those lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil. Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by slowly storing and releasing flood waters. They help maintain the quality of our water by filtering runoff, storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations. Wetlands provide an important habitat for about one-third of the plant and animal species that are federally listed as threatened or endangered.

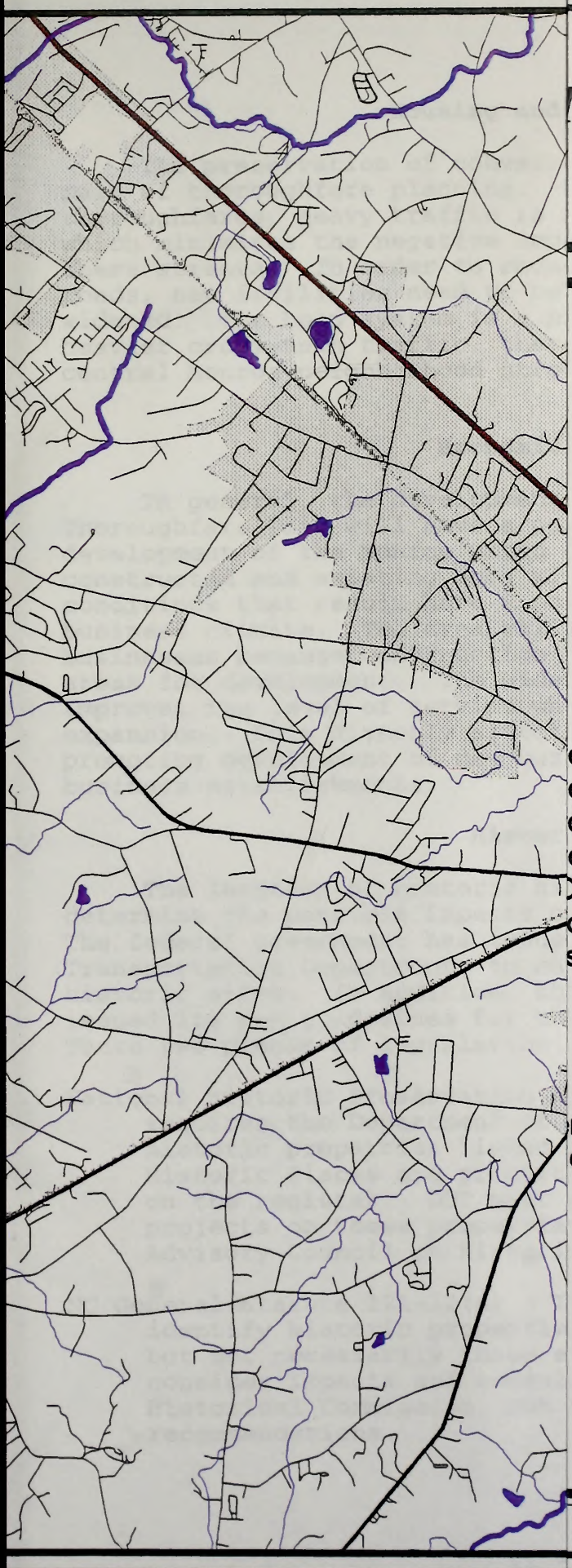
National Wetlands Inventory Mapping is not yet available for Union County. Wetlands must be determined from field inventory at the time of specific project planning. Figure 10 displays rivers, streams and bodies of water located in the planning area. These areas are likely candidates for wetland associated designations.

Threatened and Endangered Species

A preliminary review of the Federally Listed Threatened and Endangered Species within the Monroe Planning Area was done to determine the effects that proposed corridors could have on the wildlife. These species were identified using mapping for the North Carolina Natural Heritage Program.

The Threatened and Endangered Species Act of 1973 allows the U.S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered plants and animals and critical wildlife habitats. By locating rare species in the planning stage of road construction, it is possible to avoid or minimize these impacts.

The North Carolina Natural Heritage Program does not wish to publish the location and species of specific occurrences. Projects which may be affected are Walkup Avenue widening and US 601 North close to the planning boundary. Further analysis will be required on these projects during the planning and environmental screening.



IGURE 10

ROLOGY

LEGEND

o - Rivers/Streams (100k)
o -Water Bodies (100k)
o - Major Rivers/Streams (100k)
o - Major Water Bodies (100k)
DT 24k - no attributes)
oad
state

r
cipal Boundaries (24k)

N

1 2 3 Miles

well designed street network aims at reducing congestion and allowing free flow travel. A street system that provides direct movement between sections of the City reduces travel time and distances, subsequently reducing pollutant emissions. The Monroe Thoroughfare Plan promotes free flowing travel and reduces congestion which both have a positive effect on maintaining acceptable levels of emissions.

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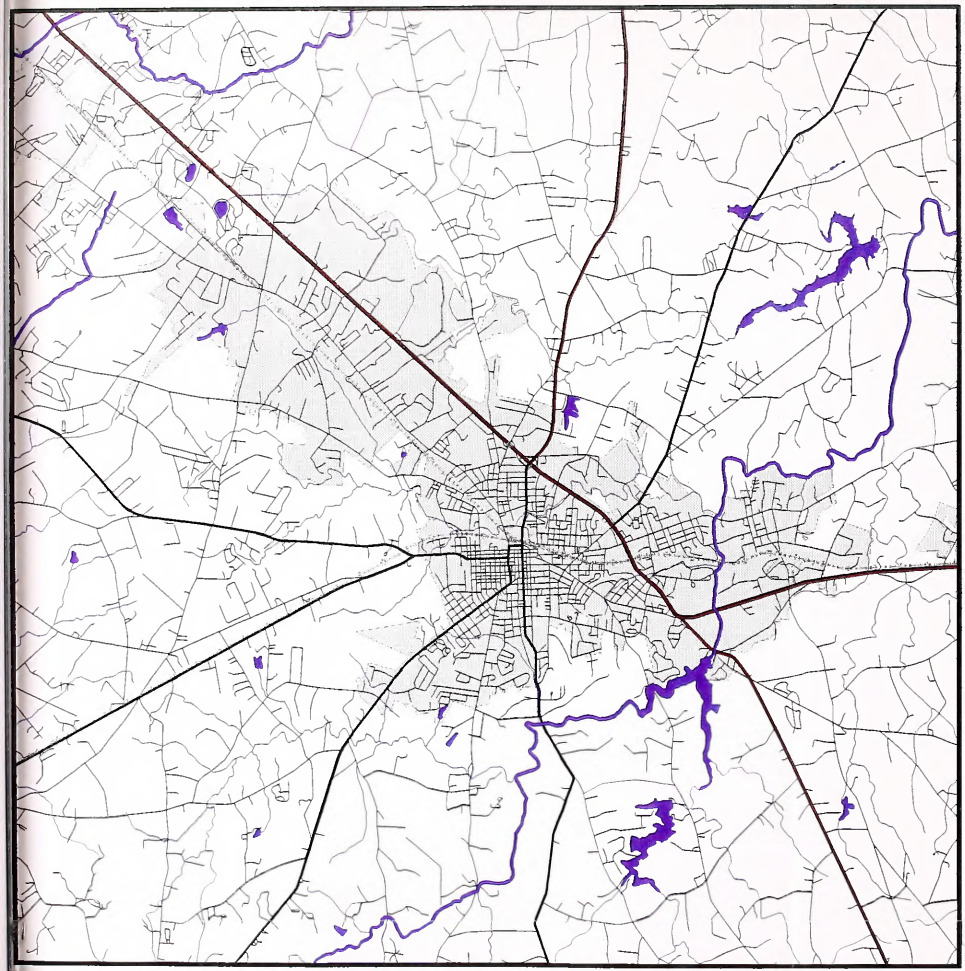


FIGURE 10

HYDROLOGY

LEGEND

- Hydro - Rivers/Streams (100k)
- Hydro -Water Bodies (100k)
- Hydro - Major Rivers/Streams (100k)
- Hydro - Major Water Bodies (100k)

Roads (DOT 24k - no attributes)

- Railroad
- Interstate
- US
- NC
- SR
- City
- Other
- Municipal Boundaries (24k)

N

1 0 1 2 3 Miles


HYDF

Housing and Neighborhoods

The preservation of cohesive neighborhoods is a fundamental part of thoroughfare planning. By designating certain streets as thoroughfares, heavy traffic is minimized on neighborhood streets which minimizes the negative impacts too much traffic can have on these streets. In order to reduce heavy traffic on residential roads, new facilities need to be constructed and/or existing ones widened. The Loop system is a proposed facility that will carry heavier cross-town traffic, thereby, relieving many downtown and central Monroe neighborhood streets of that type of traffic.

Economic Conditions

In general, the development and implementation of the Monroe Thoroughfare Plan will have a positive effect on the economic development of the Monroe urban area. As new thoroughfares are constructed and existing ones widened, the improved travel conditions that result have a positive impact on the overall business climate. The area will become more attractive to new businesses because construction of new facilities opens up land areas for development. The widening of existing thoroughfares improves the level of service which is attractive to business expansion. This directly affects employment opportunities by promoting development of new business and expansion of existing business establishments.

Historic Sites

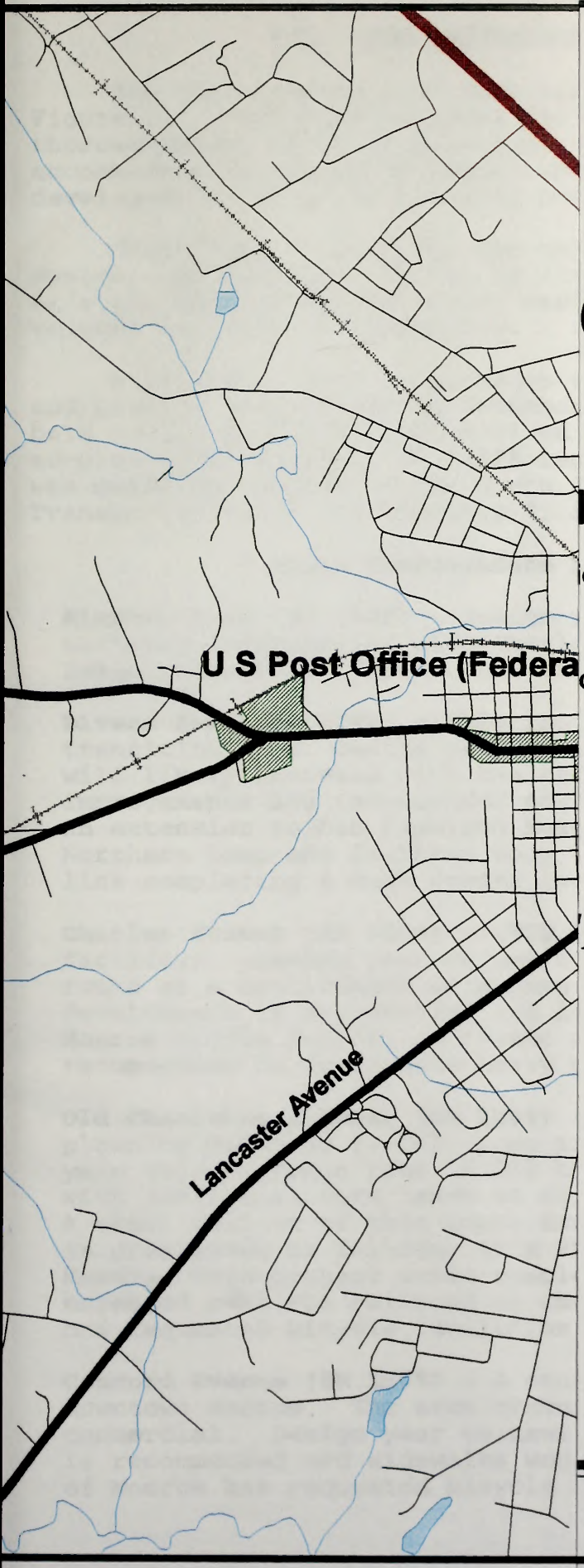
The location of historic sites in Monroe was investigated to determine the possible impacts of the various proposed projects. The federal government has issued guidelines requiring all State Transportation Departments to make special efforts to preserve historic sites. In addition, the State of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described below:

National Historic Preservation Act - Section 106 of this act requires the Department of Transportation to identify historic properties listed in the National Register of Historic Places and properties that are eligible to be listed on the register. DOT must consider the impact of its road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

NC General Statute 121-12(a) - This statute requires DOT to identify historic properties listed on the National Register, but not necessarily those eligible to be listed. DOT must consider impacts and consult with the North Carolina Historical Commission, but is not bound by their recommendations.

After researching the Monroe Planning Area, it was determined that currently a significant portion of the downtown area is listed on the National Register as an Historic District and there are five sites that are Historic Structures. These are depicted on the map in Figure 11.

Thoroughfare Plan recommendations that might affect these areas are Franklin Street widening and Charles Street improvements. A more detailed analysis will have to be made in the project planning stage.



STRUCTURES
and
C DISTRICTS

LEGEND

ic Structure - National Register

c District - National Register

IGURE 11

N

1 Miles

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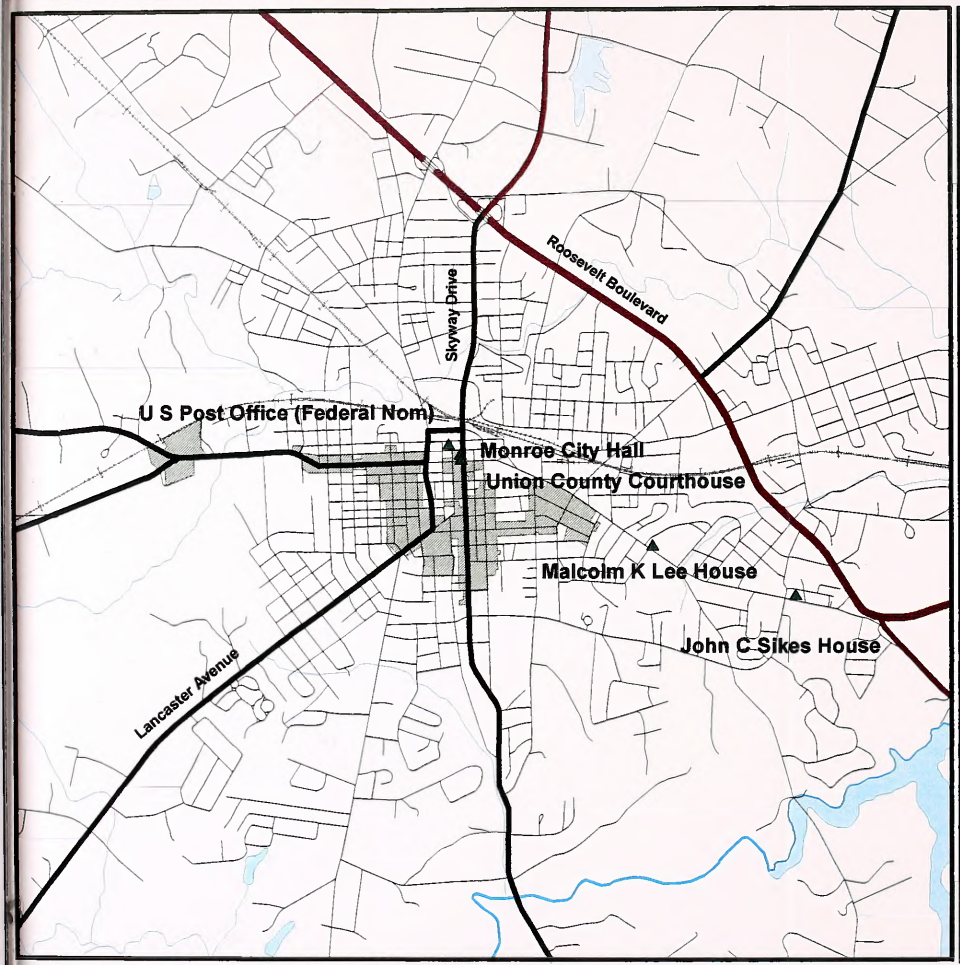

HISTORIC STRUCTURES and HISTORIC DISTRICTS

LEGEND

▲ Historic Structure - National Register

Historic District - National Register

FIGURE 11

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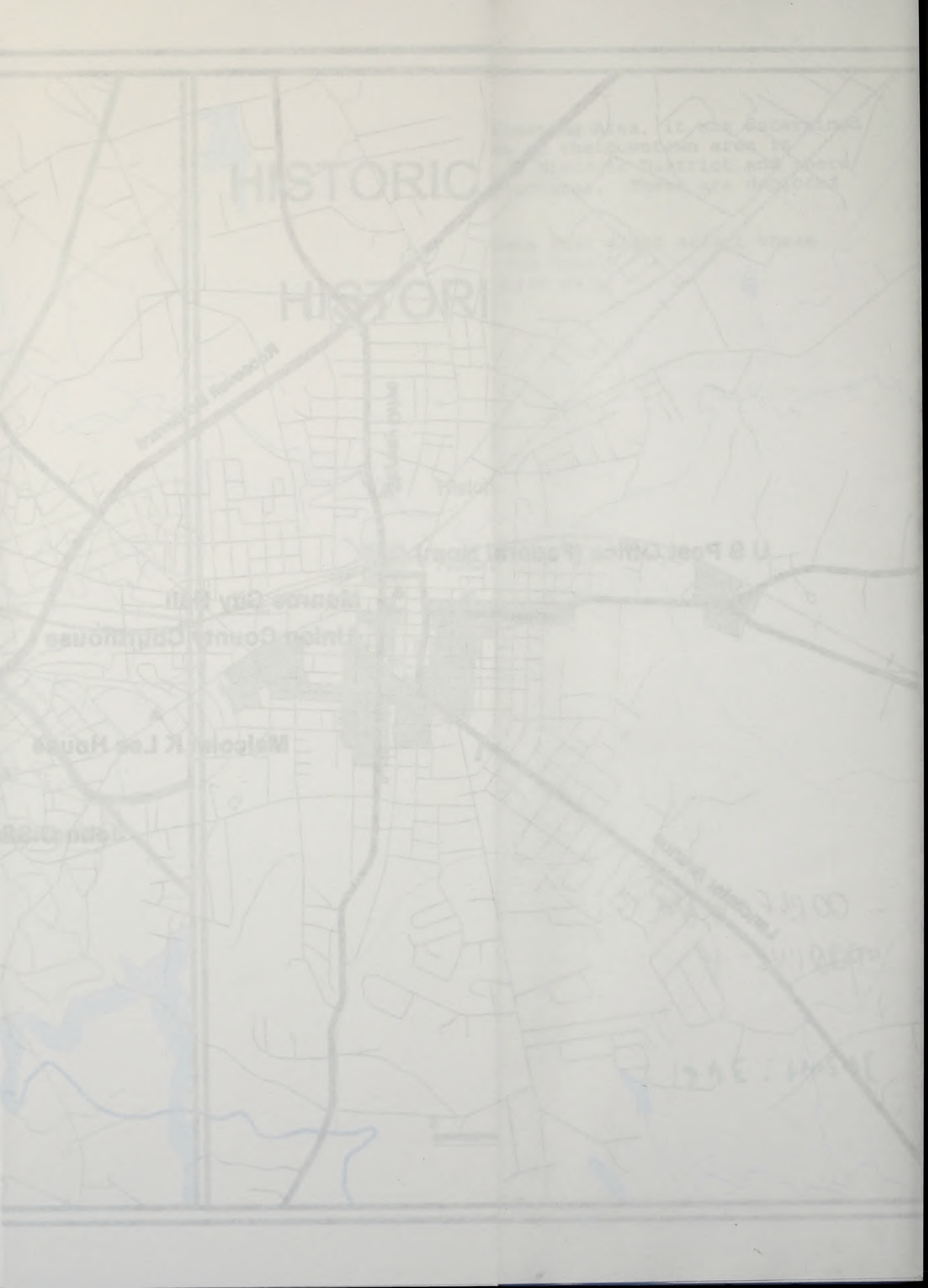


VII. THE RECOMMENDED THOROUGHFARE PLAN

The thoroughfare plan resulting from this study is shown in Figure 12. This plan provides for a system of major and minor thoroughfares, which if progressively implemented, should accommodate the expected travel desires and anticipated land development within the planning period.

This Chapter describes the major components of the thoroughfare system. An extensive street by street inventory, which includes existing and recommended cross sections, and 2020 design year volumes is shown in Appendix D.

A citizens' drop-in workshop was held to solicit public input and provide information on November 7, 1996. A public hearing was held by the Monroe City Council on December 3, 1996 and the plan was adopted a the December 17, 1996 regular Council meeting. The plan was **mutually adopted** by the North Carolina Department of Transportation at the February 7, 1997 meeting.

Major Thoroughfare Plan Recommendations

Airport Road (SR 1349) - Design year volumes are 23,000 vpd at northern intersection with Charlotte Highway. Area is mainly large industrial tracts. A 5-lane section is recommended.

Bivens Road (SR 1763) - This route is in a rural to industrial transition area. Design year volumes are only 5,000 vpd, but these will likely increase with the next plan update. Although no improvements are recommended now, development should be monitored. An extension to Old Pageland Road is proposed. Together with the Northern Loop and Southern Loop this extension provides an eastern link completing a much needed loop facility around Monroe.

Charles Street (SR 2188) - (TIP Project U-2547, widen to multilane facility). Design year volume of 9,200 vpd. Provides a crosstown route as a continuance of Morgan Mill Road (major radial). Area development is residential and includes a community center and Monroe Middle School. A 3-lane cross section with sidewalks is recommended to accomodate heavy pedestrian traffic.

Old Charlotte Highway (SR 1009) - Major radial from western planning boundary to CBD, that traverses mixed use areas. Design year volumes range from 15,000 to 24,000 vpd. A 5-lane section with additional turn lanes at major intersections is recommended. A short section of this route from the railroad to Concord Avenue is programmed as follows: (TIP Project U-213, Identified Future Need). This project would complete the corridor improvements if extended past the railroad to Church Street. The City of Monroe has requested bicycle facilities.

Concord Avenue (SR 1565) - A connector route from US 74 to downtown Monroe. The area traversed is mixed residential and commercial. Design year volumes are 15,000 vpd. A 4-lane section is recommended and sidewalks would be highly desirable. The City of Monroe has requested bicycle facilities.

Franklin Street (NC 75/84) - A major radial from the west, it continues into the CBD as part of the Franklin/Jefferson one-way pair and proceeds as a two-way facility to the east into Roosevelt Boulevard. Critical volumes of 16,000 occur from the NC 75/84 junction, easterly to Charlotte Avenue. This area is primarily residential and a 4-lane travel section is recommended. The City of Monroe has requested bicycle facilities.

Gold Mine Road (SR 1162) - A major radial leading into Monroe from the west. While design year volumes are borderline of 11,300 vpd, a four lane section is recommended for route continuity. A proposed link would tie this route into Iceman Street to provide a direct route and improve the multiple turns involved in the 'grid pattern' routing that exists.

Iceman Street (SR 1162) - Continues Gold Mine corridor into CBD. A proposed connector to Allen Street at Charlotte Avenue will make a continuous route in this corridor. But this link crosses a CSXT railway line and construction is not recommended until volumes are high enough to justify a bridge over the railway.

Morgan Mill Road (SR 200 North) - A major radial from the northern PB ending at Franklin Street in the CBD. This route will carry traffic between the CBD, the proposed US 74 Bypass, proposed Northern Loop, and Sutherland Avenue 'inner loop'. Design year volumes are projected to range between 28,000 and 40,000 vpd. Therefore, 5-lane and 7-lane improvements are recommended, respectively.

NC 75 (Waxhaw Road) - Design year volumes between the New Town Road junction and proposed Western Loop are projected to approach 14,000 vpd. A multilane section should be considered for this link as a y-line treatment for the proposed Western Loop.

Northern Loop - (U-2549, Identified Future Need) in the State TIP. Consists of a proposed facility from Dickerson Boulevard to Stafford Street Extension. Thence along existing Stafford St.Ext. to Morgan Mill Road. Then, a proposed facility to Walkup Avenue at the intersection of Bivens Road. This corridor will serve anticipated heavy growth between Monroe proper and the programmed US 74 Bypass, forming the northern part of a complete loop facility around Monroe. A multilane cross section is envisioned, with volumes ranging from 5,000 to 21,000 vpd. This route is vital in providing land service in the area between the proposed bypass and Sutherland Avenue, which is about two miles in spacing.

Olive Branch Road (SR 1006) - A radial route from the northern PB to Morgan Mill Road. Design year volumes of 14,000 vpd are forcasted from the proposed Secrest Extension intersection to Morgan Mill Road. A 5-lane section is recommended due to expected commercial and/or industrial development in the area.

Rocky River Road - Major north/south corridor that crosses entire western planning area. This route is seen as a primary 'backbone facility' from a highway system approach. High growth is expected in the western part of the planning area (the Charlotte side). The airport area and accompanying large manufacturing/warehousing sites are served by Rocky River Road, which is recommended to have an interchange with the programmed US 74 Bypass. A minimum 100'

right-of-way is recommended to be protected where possible. Future traffic volumes will necessitate multilane cross sections. Access control and setback requirements are strongly recommended to maintain the integrity of this vital piece of the thoroughfare system.

Roosevelt Boulevard (US 74) - This is the major arterial running through Monroe. Projected volumes are from 24,000 to 46,000 vpd, even with the proposed US 74 Bypass diverting most through trips and most external-internal traffic entering the area from north of the bypass. This 4LD/6LD cross section is expected to provide sufficient capacity, except the 4LD section from Dickerson Boulevard to the western planning boundary, which is recommended to be expanded to a 6LD cross section toward the end of the planning period.

Secrest Avenue - The existing route traverses a well developed industrial/manufacturing area. An extension is proposed to provide access to the proposed Northern Loop, the planned US 74 Bypass (via an interchange) and terminating with a connection to Olive Branch Road. A high truck percentage is expected on this facility and volumes are projected to 20,000 vpd. A 5-lane cross section is recommended for the existing and proposed facilities.

Southern Loop - This route provides east/west travel service from Old Pageland Road to Rocky River Road. Proposed sections link up existing Fletcher Broome Road, Helms Short Cut Road, and Belmont Church Road to form the only east/west continuous route within 2 miles of central Monroe. A ultimate 4-lane section is recommended on 100' of right-of-way for new construction.

Sutherland Avenue - The section from Morgan Mill Road to Sunset Drive abutts land uses from industrial to medical, with varying pavement widths. A consistent 3-lane section is recommended from Morgan Mill Rd. to Roosevelt Blvd., and 5-lanes from Roosevelt to Sunset Drive.

US 74 Bypass - A 4-lane divided freeway is programmed in the State TIP (R-2559) to begin construction in the year 2000. The route will parallel existing US 74 at about 2 miles north. Anticipated design year volumes range from 28,000 to 39,000 vpd.

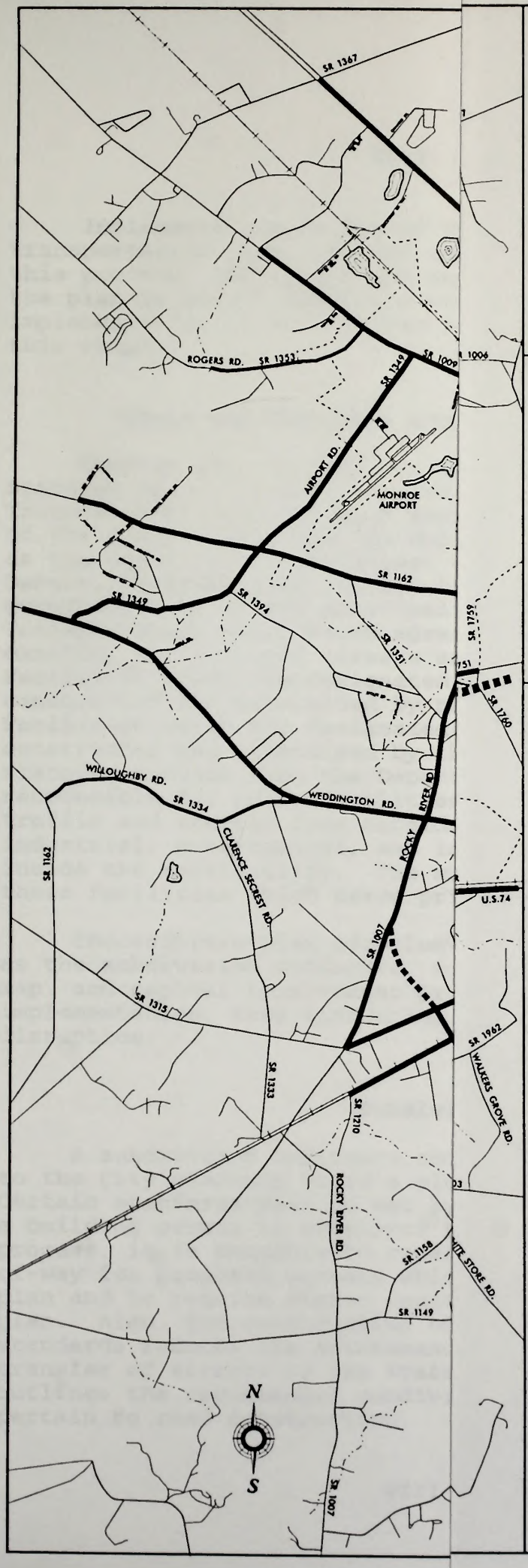
US 601 North - With a planned interchange at the US 74 Bypass, design year volumes are expected to reach 27,000 vpd between the Bypass and the Northern Loop. A multilane section is recommended from the northern planning boundary to Roosevelt Boulevard. A 4-lane divided/median cross section would provide a practical boulevard and limit future driveway interference from hindering capacity. The City of Monroe requests bicycle facilities.

US 601 South - A 5-lane widening project (R-2616) is currently under construction from Roosevelt Boulevard to the South Carolina State Line.

Walkup Avenue - A major radial entering from the east, it leads into central Monroe. An ultimate 5-lane cross section is recommended from Secrest Avenue to Roosevelt Boulevard and a 4-lane section from Roosevelt Boulevard to Morgan Mill Road.

Western Loop - A proposed major loop from the Southern Loop to Old Charlotte Highway. The link from Charlotte Highway to Lancaster Avenue is programmed as (U-3412, Dickerson Blvd. Ext.). A 4-lane divided cross section here would allow for some access control and provide a nice urban boulevard atmosphere to accomodate expected substantial growth on the west side of Monroe. This route would relieve heavy truck traffic in the downtown area, that currently has no other route to US 74 Business and the future US 74 Bypass. This route, as part of a complete outer loop for Monroe, allows suburban travel between the major radials entering central Monroe.

Winchester Avenue - A crosstown link from Skyway Drive to Morgan Mill Road. An ultimate four lane cross section is recommended to provide continuity through developed areas between these to routes.



LEGEND

	EXISTING	PROPOSED
FREEWAY	———	- - - -
MAJOR	———	- - - -
MINOR	———	- - - -
INTERCHANGE	●	◉

ADOPTED BY:

CITY OF MONROE	12-17-96
CITIZEN'S WORKSHOP	11-7-96
PUBLIC HEARING	12-3-96
RECOMMENDED BY STATEWIDE PLANNING	12-19-96
N.C. DEPARTMENT OF TRANSPORTATION	2-7-97

FIGURE 12

DECEMBER 17, 1996

THOROUGHFARE PLAN FOR MONROE

UNION COUNTY NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

2000 0 2000 4000 6000 scale in feet

500 0 500 1000 1500 2000 scale in meters

Base Map Date
August 13, 1996

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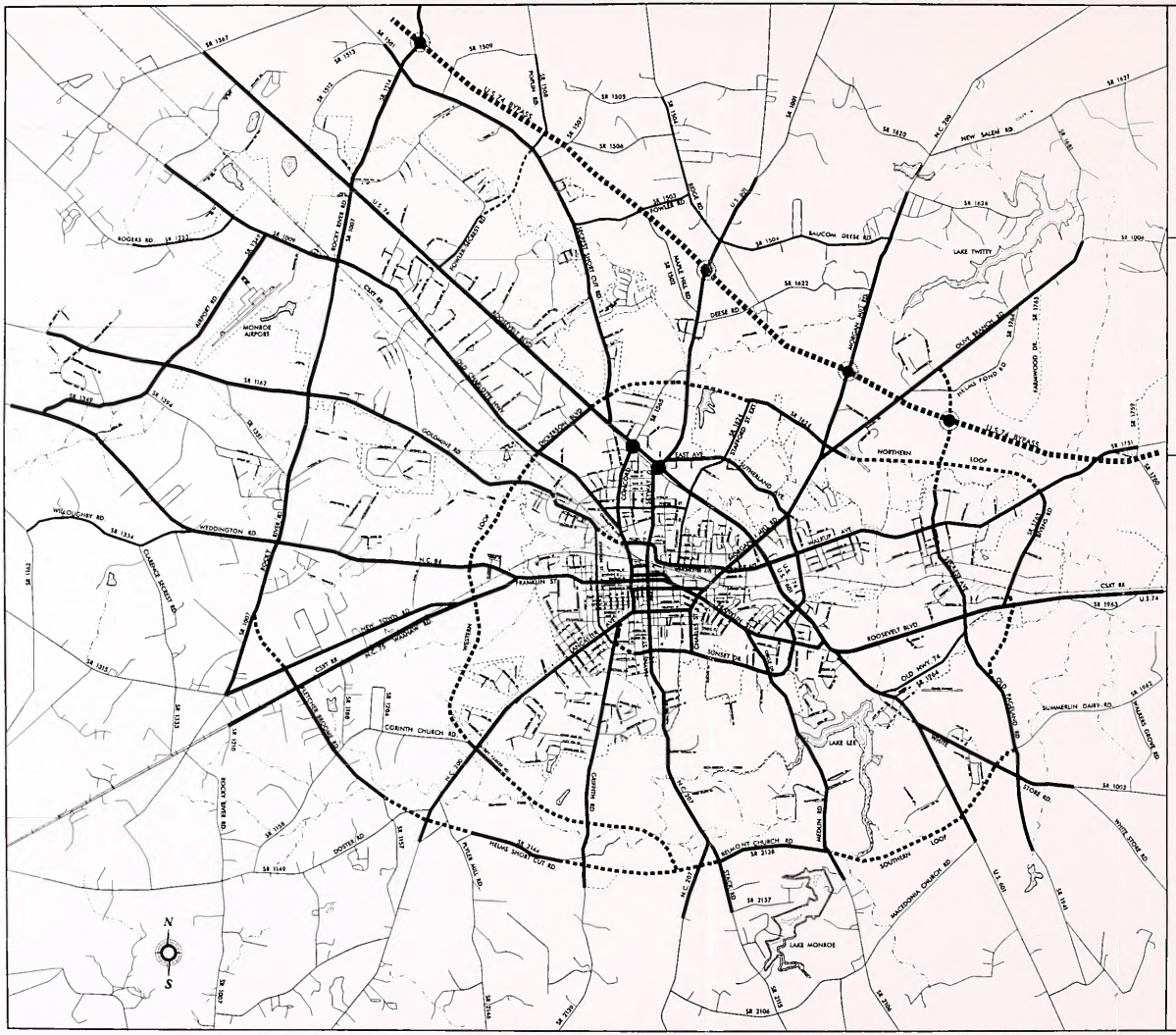

LEGEND

	EXISTING	PROPOSED
FREEWAY	———	·····
MAJOR	———	·····
MINOR	———	·····
INTERCHANGE	●	◉

ADOPTED BY:

CITY OF MONROE	12-17-96
CITIZEN'S WORKSHOP	11-7-96
PUBLIC HEARING	12-3-96
RECOMMENDED BY STATEWIDE PLANNING	12-19-96
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DECEMBER 17, 1996

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FEDERAL HIGHWAY ADMINISTRATION

2000 0 2000 4000 6000 scale in feet

500 0 500 1000 1500 2000 scale in meters

Base Map Date
August 13, 1996

VIII. IMPLEMENTATION

Implementation is one of the most important aspects of the transportation plan. Unless implementation is an integral part of this process, the effort and expense associated with developing the plan is lost. There are several tools which are available for implementation of the thoroughfare plan, which are discussed in this chapter.

State and Municipal Adoption of the Thoroughfare Plan

Chapter 136, Article 3A, Section 136-66.2 of the General Statutes of North Carolina provides that after development of a Thoroughfare Plan, the Plan may be adopted by the governing body of the municipality and the Department of Transportation to serve as the basis for future street and highway improvements. The General Statutes also require that, as part of the plan, the governing body of the municipality and Department of Transportation shall reach agreement on responsibilities for existing and proposed streets and highways included in the plan. Facilities which are designated a State responsibility will be constructed and maintained by the Division of Highways. Facilities which are designated a municipal responsibility will be constructed and maintained by the municipality. In summary, these statutes provide that the Department of Transportation shall be responsible for those facilities which serve volumes of through traffic and traffic from outside the area to major business, industrial, governmental, and institutional destinations located inside the municipality. The municipality is responsible for those facilities which serve primarily internal or local travel.

Thoroughfare plan adoption enables other planning tools such as the subdivision ordinance, zoning ordinance, official street map, and capital improvement program to be used in assisting plan implementation, thus minimizing public cost and land use disruption.

Subdivision Control

A subdivision ordinance requires that every subdivider submit to the City Planning Board a plot of the proposed subdivision. Certain standards must be met by the developer before being issued a building permit to construct the development. Through this process, it is possible to reserve or protect the necessary right-of-way for proposed streets which are a part of the thoroughfare plan and to require street construction in accordance with the plan. Also, the construction of subdivision streets to adequate standards reduces the maintenance costs and simplifies the transfer of streets to the State Highway System. Appendix B outlines the recommended subdivision design standards as they pertain to road construction.

Roadway Corridor Official Map

North Carolina General Statutes 136-44.50 through 133-44.53 are collectively designated as the "Roadway Corridor Official Map Act." The roadway corridor official map, more commonly referred to as an official street map, is a document adopted by the legislative body of the community that pinpoints and preserves the location of proposed streets against encroachment. In effect, the official map serves notice on developers that the State or municipality intends to acquire certain specific property. The map serves as a positive influence for sound development by reserving sites for public improvements prior to actual need.

The NCDOT limits its use of official maps to large scale, fully controlled access facilities planned for developing areas outside of municipal jurisdictions. For projects within municipal jurisdictions, official maps should be prepared and adopted by the local government.

For cities contemplating the adoption of a Roadway Corridor Map, there are several things to consider. First, it should be recognized that an Official Street Map designation places severe, but temporary, restrictions on private property rights. These restrictions are in the form of a prohibition, for up to three years, on the issuance of building permits or the approval of subdivision of property lying within an Official Street Map corridor. The three year reservation period begins with the request for development approval. This authority should be used carefully and only in cases where less restrictive powers will be ineffective.

The Statute establishing the Official Street Map authority is fairly explicit in outlining the procedures to be followed and the types of projects to be considered. As required by the Statute, a project being considered for an Official Street Map must be programed in the State's Transportation Improvement Program (TIP) or included in a locally adopted Capital Improvements Program in addition to appearing on the adopted street system plan. The Statute states that the Capital Improvements Program must be for a period of ten years or less and must identify the estimated cost of acquisition and construction of the proposed project as well as the anticipated financing.

The Program Development Branch of the North Carolina Department of Transportation is responsible for facilitating the adoption of Official Street Maps. Cities considering Official Street Map projects should contact this Branch for their "Guidelines for Municipalities Considering Adoption of Roadway Corridor Maps" at:

Program Development Branch
NC Department of Transportation
Post Office Box 25201
Raleigh, NC 27611-5201

Zoning

A zoning ordinance can be beneficial to thoroughfare planning by designating appropriate locations of various land uses and allowable densities of residential development. This provides a degree of stability by which future traffic projections can be made and streets and highways can be planned.

Other benefits of a good zoning ordinance are: (1) the establishment of standards of development which will aid traffic operations on major thoroughfares and (2) the minimization of strip commercial development which creates traffic friction and increases the traffic accident potential.

Development Plan Reviews

Driveway access to a State-maintained street or highway is reviewed by the District Engineer's office and by the Traffic Engineering Branch of the North Carolina Department of Transportation prior to access being permitted. Any development expected to generate large volumes of traffic (ie. shopping centers, office buildings, industries, etc.) may be comprehensively studied by staff from the Traffic Engineering, Statewide Planning, and Roadway Design Branches of NCDOT. If done at an early stage, it is often possible to significantly improve the development's accessibility at minimal expense. Since the municipality is the first point of contact for the developer, it is important that the municipality advise them of this review requirement and cooperate in the review process.

Urban Renewal

Urban renewal is defined as the rehabilitation of city areas by demolishing, remodeling, or repairing existing structures in accordance with comprehensive plans. This process allows for corrections to basic problems in the street system layout and design.

To qualify for community development funds or discretionary funds for urban renewal, a city must first prepare a community development program. Urban areas compete throughout the State on the basis of demographic points which consider such conditions as percent of substandard housing, people per square feet of housing, dwelling age, etc. An effort should be made to ensure that community development and transportation plans are compatible.

Funding Sources

Capital Improvements Program

One of the tools which makes it easier to build a planned thoroughfare system is a Capital Improvements Program. This is a long range budget for street improvements, acquisition of right-of-way, and other capital improvements on the basis of projected revenues. Municipal funds should be available for construction of street improvements which are a municipal responsibility, right-of-way cost sharing on facilities designated a Division of Highways responsibility, and advance purchase of right-of-way where such action is required.

The improvement groupings in this report should provide a basis by which the City of Monroe can develop their Capital Improvements Program. This program could be used to benefit any of the existing and proposed local thoroughfares listed in this plan.

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is a document which lists all major construction projects the Department of Transportation plans for the next seven years. Similar to local Capital Improvement Program projects, TIP projects are matched with projected funding sources. Each year when the TIP is updated , completed projects are removed, programed projects are advanced, and new projects are added.

During annual TIP public hearings, municipalities request projects to be included in the TIP. A Board of Transportation member reviews all of the project requests in a particular area of the state. Based on the technical feasibility, need, and available funding, the board member decides which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement projects, highway safety projects, public transit projects, railroad projects, and bicycle projects.

Industrial Access Funds

If an industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be made available for construction of an access road.

Small Urban Funds

Small Urban Funds are annual discretionary funds made to municipalities with qualifying projects. The maximum amount is $150,000 per year per project. A City may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

Other Funding Sources

1. Assess user impact fees to fund transportation projects. These fees, called "facility fees" in the legislation, are to be based upon "reasonable and uniform considerations of capital costs to be incurred by the town as a result of new construction. The facility fee must bear a direct relationship to additional or expanded public capital costs of the community service facilities to be rendered for the inhabitants, occupants of the new construction, or those associated with the development process".

2. Enact a bond issue to fund street improvements.

3. Continue to work with NCDOT to have local projects included in the Transportation Improvement Program (TIP).

4. Consider the possibility of specific projects qualifying for federal demonstration project funds.

5. Adopt a collector street plan that would assess buyer or property owners for street improvement.

APPENDIX A

SOCIO-ECONOMIC AND TRIP DATA

Base Year IDS Input Data

Design Year IDS Input Data

Base Year Employment

Design Year Employment

Cordon Station Travel

APPENDIX A

SOCIO-ECONOMIC AND TRIP DATA

Base Year IDS Input Data

Design Year IDS Input Data

Base Year Employment

Design Year Employment

Corridor Station Travel

Table A-1
Base Year (1992) IDS Input Data
Monroe Planning Area

Zone	Dwelling Units Ratings					Commercial Vehicles		Employ-ment
	Ex	AA	A	BA	Low	Trks	Auto	
1	0	0	0	0	0	17	115	809
2	1	2	8	9	0	36	48	489
3	0	5	29	42	20	25	11	489
4	5	31	93	114	24	4	0	54
5	0	4	75	80	9	4	1	123
6	0	3	114	178	12	16	11	140
7	0	0	8	162	115	4	2	300
8	0	0	80	167	61	62	18	482
9	0	0	53	177	14	12	24	317
10	0	0	0	11	31	27	8	430
11	0	0	10	221	82	42	4	84
12	0	0	0	29	0	65	18	344
13	0	1	285	192	118	10	18	142
14	0	1	55	132	3	5	1	118
15	0	36	182	17	0	0	0	0
16	0	20	212	14	0	0	1	8
17	0	24	150	103	0	2	0	79
18	1	0	144	28	0	12	8	1,074
19	0	0	12	23	6	19	1	180
20	0	0	0	3	62	4	0	70
21	0	0	0	2	6	7	4	508
22	0	0	6	5	1	3	3	168
23	0	0	0	0	0	23	5	421
24	0	0	19	88	17	63	14	270
25	0	0	0	4	21	12	13	284
26	0	0	20	44	24	0	0	68
27	0	1	46	28	0	18	6	892
28	0	10	257	114	0	3	1	373
29	0	6	41	32	0	0	0	2
30	0	8	24	15	0	1	0	4
31	1	15	60	14	1	3	0	7
32	0	10	61	0	0	0	0	0
33	0	4	109	14	0	0	0	77
34	0	12	94	130	2	3	1	37
35	0	33	154	11	0	4	0	10
36	0	1	15	3	0	0	0	2
37	0	1	20	93	3	102	57	972
38	0	2	95	3	0	0	1	11
39	0	0	115	44	0	4	17	108
40	0	3	17	3	0	36	10	405
41	0	1	56	35	0	0	0	0
42	0	0	12	18	0	100	30	1,160
43	0	0	222	67	0	30	11	895
44	0	0	56	21	2	273	14	296
45	0	4	1	0	0	3	1	266
46	0	16	13	2	0	0	0	87
47	2	27	47	0	0	0	0	0
48	2	18	43	2	1	0	0	0
49	0	11	48	7	1	0	1	14
50	1	0	50	4	0	0	0	2
51	1	2	24	0	0	0	0	0
52	0	9	22	1	0	4	0	107

Zone	Dwelling Units Ratings					Commercial Vehicles		Employment
	Ex	AA	A	BA	Low	Trks	Auto	
53	0	1	4	0	1	0	0	0
54	0	1	0	0	1	26	4	254
55	0	0	1	0	0	12	12	1,829
56	0	0	4	0	0	4	6	266
57	0	0	53	1	0	10	4	455
58	0	1	5	1	1	95	19	1,111
59	0	0	0	0	0	7	3	166
60	0	0	30	205	15	65	5	220
61	0	3	37	0	1	43	13	871
62	0	0	15	48	0	1	1	11
63	0	0	3	0	0	20	2	35
64	0	0	6	2	0	0	0	0
65	0	0	20	2	0	1	0	1
66	0	38	44	2	0	1	1	4
67	0	1	70	20	0	3	0	9
68	1	18	99	11	1	0	2	4
69	0	5	61	6	0	36	27	104
70	11	125	14	0	0	0	3	51
71	0	4	154	11	2	34	6	201
72	0	1	268	38	1	0	0	4
73	0	2	206	141	0	6	5	30
74	0	1	18	46	0	78	33	2,028
75	0	30	385	97	5	40	15	208
76	0	0	102	40	15	76	54	799
77	0	5	56	22	2	8	4	32
78	0	7	59	45	10	0	2	12
79	0	0	84	17	1	6	0	8
TOTAL	26	564	5055	3261	692	1630	699	21,891

GRAND TOTAL = 9598

WHERE:

	Occupancy Rates	Trips per Dwelling Unit
Ex = excellent	(2.7)	(12.0)
AA = above average	(2.7)	(10.0)
A = average	(2.7)	(8.0)
BA = below average	(2.7)	(7.0)
Low= poor	(2.7)	(4.0)

Trips per Truck.....(6.7)
Trips per Commercial Auto.....(6.7)

Trip Percentages by Purpose
- Internal of Total.....(85)
- Home Based Work (HBW).....(22)
- Home Based Other(HBO).....(52)
- Non Home Based (NHB).....(26)

NHB Secondary Trips.....(29,200)
External Station Trips.....(86,271)

Table A-2
Design Year (2020) IDS Input Data
Monroe Planning Area

Zone	Dwelling Units Ratings					Commercial Vehicles		Employ-ment
	Ex	AA	A	BA	Low	Trks	Auto	
1	0	0	0	0	0	17	115	809
2	1	2	8	9	0	36	48	489
3	0	5	29	42	20	25	11	489
4	5	31	93	117	24	4	0	54
5	0	4	75	80	9	4	1	123
6	0	3	114	180	12	16	11	140
7	0	0	8	177	130	4	2	320
8	0	0	93	167	61	62	18	482
9	0	0	53	177	14	12	24	317
10	0	0	0	11	31	27	8	430
11	0	0	13	221	82	42	4	84
12	0	0	0	29	0	65	18	344
13	0	1	305	212	118	10	18	142
14	0	1	60	137	3	5	1	128
15	0	46	202	27	0	0	0	0
16	0	20	215	14	0	0	1	8
17	0	24	155	108	0	2	0	79
18	1	0	214	48	10	12	8	1,104
19	0	0	15	23	6	19	1	190
20	0	0	0	3	62	4	0	80
21	0	0	0	2	6	11	5	578
22	0	0	6	5	1	3	3	183
23	0	0	0	0	0	24	6	441
24	0	0	19	90	17	67	15	295
25	0	0	0	4	21	13	14	324
26	0	0	20	44	24	0	0	68
27	0	1	46	28	0	20	7	992
28	0	10	262	114	0	3	1	373
29	0	6	51	42	0	0	0	2
30	0	18	54	25	0	1	0	14
31	1	25	80	24	1	3	0	7
32	0	15	81	0	0	0	0	0
33	0	9	149	19	0	0	0	107
34	0	72	244	330	42	8	4	97
35	10	123	484	61	20	6	1	30
36	0	31	115	73	0	2	2	102
37	0	11	50	193	13	117	70	1,172
38	0	7	165	8	0	0	1	16
39	0	0	155	54	0	4	17	108
40	0	3	27	3	0	54	12	605
41	0	1	66	45	0	20	10	1,000
42	0	0	12	18	0	111	30	1,240
43	0	0	237	67	0	30	11	895
44	0	0	56	21	2	89	18	356
45	0	34	11	0	0	3	1	281
46	0	21	18	2	0	0	0	87
47	12	47	77	0	0	2	1	60
48	12	48	83	2	1	0	0	0
49	0	31	98	17	1	1	2	34
50	6	10	60	9	0	0	0	2
51	3	5	34	0	0	0	0	0
52	0	15	32	5	0	4	0	107

Zone	Dwelling Units Ratings					Commercial Vehicles		Employ-ment
	Ex	AA	A	BA	Low	Trks	Auto	
53	0	2	7	0	2	3	1	50
54	0	1	0	0	1	40	8	404
55	0	0	1	0	0	12	12	1,839
56	0	0	5	0	0	6	8	316
57	0	0	53	1	0	10	4	455
58	0	1	5	1	1	103	23	1,151
59	0	0	0	0	0	9	4	216
60	0	0	33	220	17	65	5	220
61	0	3	37	0	1	46	18	911
62	0	0	16	52	0	1	1	11
63	0	0	18	0	0	30	5	135
64	0	0	10	3	0	50	10	1,500
65	0	0	60	7	0	10	2	501
66	0	98	124	12	0	3	3	54
67	0	11	230	50	0	6	3	59
68	6	63	349	46	16	10	6	404
69	10	45	411	46	10	37	28	114
70	21	175	54	0	0	1	3	61
71	0	14	204	26	7	35	7	226
72	0	21	618	88	31	4	2	54
73	0	12	336	251	25	7	6	80
74	0	4	23	56	2	160	60	5,588
75	10	80	785	197	45	60	20	358
76	5	15	252	90	45	85	60	999
77	5	15	216	92	27	9	5	72
78	5	22	199	145	50	0	2	17
79	5	10	184	42	11	6	0	8
TOTAL	118	1272	8674	4512	1022	1770	826	31,191

GRAND TOTAL = 15,598

WHERE:

	Occupancy Rates	Trips per Dwelling Unit
Ex = excellent	(2.5)	(13.0)
AA = above average	(2.5)	(11.0)
A = average	(2.5)	(9.0)
BA = below average	(2.5)	(8.0)
Low= poor	(2.5)	(5.0)

Trips per Truck.....(6.7)
Trips per Commercial Auto.....(6.7)

Trip Percentages by Purpose
- Internal of Total.....(85)
- Home Based Work (HBW).....(22)
- Home Based Other(HBO).....(52)
- Non Home Based (NHB).....(26)

NHB Secondary Trips.....(67,900)
External Station Trips.....(192,622)

Table A-3

Employment for Base Year 1992

Monroe Planning Area

Zone	Employment Grouping X1	X2	X3	X4	X5	TOTAL
1	0	30	10	647	122	809
2	73	87	27	19	283	489
3	21	56	10	112	290	489
4	0	0	0	0	54	54
5	6	0	19	24	74	123
6	9	112	0	15	4	140
7	273	20	4	0	23	320
8	48	41	38	18	337	482
9	14	29	20	138	116	317
10	361	39	9	6	15	430
11	0	0	0	0	84	84
12	57	175	4	7	101	344
13	6	4	2	17	113	142
14	0	79	20	4	25	128
15	0	0	0	0	0	0
16	0	3	0	0	5	8
17	0	64	11	0	4	79
18	10	813	172	40	69	1,104
19	0	45	88	19	38	190
20	0	9	59	5	7	80
21	41	178	168	84	107	578
22	5	41	92	6	39	183
23	0	95	262	21	63	441
24	16	127	43	17	92	295
25	60	244	0	0	20	324
26	0	0	0	0	68	68
27	19	8	0	16	949	992
28	0	8	0	3	362	373
29	0	0	0	0	2	2
30	1	0	13	0	0	14
31	0	0	0	3	4	7
32	0	0	0	0	0	0
33	0	0	23	26	58	107
34	0	31	30	1	35	97
35	0	20	7	0	3	30
36	50	50	0	0	2	102
37	190	446	364	35	137	1,172
38	5	0	5	0	6	16
39	21	15	17	10	45	108
40	490	75	0	0	40	605
41	700	300	0	0	0	1,000
42	599	301	218	46	76	1,240
43	675	194	6	0	20	895
44	66	0	77	101	112	356
45	0	93	59	10	119	281
46	0	0	0	0	87	87
47	0	0	0	0	60	60
48	0	0	0	0	0	0
49	0	5	26	0	3	34
50	0	0	0	0	2	2
51	0	0	0	0	0	0
52	0	4	0	0	103	107

Table A-3
Employment for Base Year 1992
Monroe Planning Area

Zone	Employment Grouping X1	X2	X3	X4	X5	TOTAL
53	0	0	0	0	0	0
54	248	0	0	0	6	254
55	1,768	4	57	0	0	1,829
56	255	0	11	0	0	266
57	305	150	0	0	0	455
58	993	90	1	0	27	1,111
59	126	40	0	0	0	166
60	46	4	0	59	111	220
61	832	28	0	0	11	871
62	0	0	0	10	1	11
63	35	0	0	0	0	35
64	0	0	0	0	0	0
65	1	0	0	0	0	1
66	2	0	0	0	2	4
67	1	0	1	0	7	9
68	0	0	0	1	3	4
69	78	3	13	9	1	104
70	0	0	8	0	43	51
71	68	5	61	39	28	201
72	0	0	0	0	4	4
73	15	2	0	0	13	30
74	1,158	273	0	286	311	2,028
75	12	76	49	44	27	208
76	435	309	5	4	46	799
77	0	30	0	0	2	32
78	3	0	3	0	6	12
79	1	0	0	0	7	8
TOTAL	9298	4225	1757	1822	4789	21891

Where: (SIC Codes)

X1 = Manufacturing, (0-49)
X2 = Wholesale/Retail, (50-54, 56, 57, 59)
X3 = Highway Retail, (55, 58)
X4 = Office/Institutional, (60-67, 91-97)
X5 = Services, (70-76, 78-89, 99)

Table A-4
Employment for Design Year 2020
Monroe Planning Area

Zone	Employment Grouping X1	X2	X3	X4	X5	TOTAL
1	0	30	10	647	122	809
2	73	87	27	19	283	489
3	21	56	10	112	290	489
4	0	0	0	0	54	54
5	6	0	19	24	74	123
6	9	112	0	15	4	140
7	273	20	4	0	23	320
8	48	41	38	18	337	482
9	14	29	20	138	116	317
10	361	39	9	6	15	430
11	0	0	0	0	84	84
12	57	175	4	7	101	344
13	6	4	2	17	113	142
14	0	79	20	4	25	128
15	0	0	0	0	0	0
16	0	3	0	0	5	8
17	0	64	11	0	4	79
18	10	813	172	40	69	1,104
19	0	45	88	19	38	190
20	0	9	59	5	7	80
21	41	178	168	84	107	578
22	5	41	92	6	39	183
23	0	95	262	21	63	441
24	16	127	43	17	92	295
25	60	244	0	0	20	324
26	0	0	0	0	68	68
27	19	8	0	16	949	992
28	0	8	0	3	362	373
29	0	0	0	0	2	2
30	1	0	13	0	0	14
31	0	0	0	3	4	7
32	0	0	0	0	0	0
33	0	0	23	26	58	107
34	0	31	30	1	35	97
35	0	20	7	0	3	30
36	50	50	0	0	2	102
37	190	446	364	35	137	1,172
38	5	0	5	0	6	16
39	21	15	17	10	45	108
40	490	75	0	0	40	605
41	700	300	0	0	0	1,000
42	599	301	218	46	76	1,240
43	675	194	6	0	20	895
44	66	0	77	101	112	356
45	0	93	59	10	119	281
46	0	0	0	0	87	87
47	0	0	0	0	60	60
48	0	0	0	0	0	0
49	0	5	26	0	3	34
50	0	0	0	0	2	2
51	0	0	0	0	0	0
52	0	4	0	0	103	107

Table A-4

Employment for Design Year 2020

Monroe Planning Area

Zone	Employment Grouping X1	X2	X3	X4	X5	TOTAL
53	0	50	0	0	0	50
54	278	30	30	30	36	404
55	1,768	14	57	0	0	1,839
56	280	25	11	0	0	316
57	305	150	0	0	0	455
58	1,013	110	1	0	27	1,151
59	151	65	0	0	0	216
60	46	4	0	59	111	220
61	852	48	0	0	11	911
62	0	0	0	10	1	11
63	85	50	0	0	0	135
64	1,000	200	100	200	0	1,500
65	401	100	0	0	0	501
66	2	0	50	0	2	54
67	1	0	51	0	7	59
68	0	200	100	51	53	404
69	78	3	23	9	1	114
70	0	0	18	0	43	61
71	68	5	86	39	28	226
72	0	25	25	0	4	54
73	15	27	25	0	13	80
74	4,658	333	0	286	311	5,588
75	12	76	199	44	27	358
76	435	309	205	4	46	999
77	0	50	20	0	2	72
78	3	0	8	0	6	17
79	1	0	0	0	7	8
TOTAL	15268	5715	2912	2182	5114	31,191

Where: (SIC Codes)

X1 = Manufacturing, (0-49)
X2 = Wholesale/Retail, (50-54, 56, 57, 59)
X3 = Highway Retail, (55, 58)
X4 = Office/Institutional, (60-67, 91-97)
X5 = Services, (70-76, 78-89, 99)

Cordon Station Travel

Station	Location	Base Year 1992				Design Year 2020			
		Total ADT	Thru %	Thru Trip Ends	Ext-Int Trips	Total ADT	Thru %	Thru Trip Ends	Ext-Int Trips
86	US 601 South	12,200	65.0	7,800	4,400	18,000	65.0	11,700	6,300
87	Medlin Road/SR 2102	1,000	11.0	110	890	1,800	11.1	200	1,600
88	Stack Road/SR 2115	2,300	8.0	180	2,120	4,100	8.1	334	3,766
89	NC 207 South	3,500	12.0	420	3,080	5,300	11.9	630	4,670
90	Griffith Road/SR 2139	2,400	10.0	240	2,160	4,000	10.1	404	3,596
91	Plyler Mill Road/SR 2146	800	3.0	20	780	2,000	3.0	60	1,940
92	NC 200 South	5,300	15.0	800	4,500	11,000	15.0	1,652	9,348
93	Doster Road/SR 1149	900	3.0	30	870	1,500	3.1	46	1,454
94	Corinth Church Road/SR 1158	700	3.0	20	680	1,300	2.8	36	1,264
95	Waxhaw Road/NC 75 South	6,800	20.0	1,360	5,440	10,800	20.0	2,164	8,636
96	New Town Road/SR 1315	1,700	12.0	200	1,500	5,000	11.8	590	4,410
97	Rocky River Rd South/SR 1007	3,800	15.0	570	3,230	7,000	15.1	1,058	5,942
98	Clarence Secrest Rd/SR 1333	350	2.0	10	340	2,000	1.7	34	1,966
99	Willoughby Road/SR 1334	500	2.0	10	490	2,000	1.7	34	1,966
100	Weddington Road/NC 84	3,600	13.0	470	3,130	10,000	13.0	1,298	8,702
101	Goldmine Road/SR 1162	1,200	5.0	60	1,140	3,000	4.9	146	2,854
102	Rogers Road/SR 1353	700	3.0	20	680	5,000	3.0	150	4,850
103	Old Charlotte Hwy/SR 1009	9,000	20.0	1,800	7,200	17,000	17.7	3,014	13,986
104	US 74 West/Roosevelt Blvd	34,000	75.0	25,500	8,500	36,500	38.8	14,166	22,334
105	Secrest Short Cut Rd/SR 1501	3,200	12.0	380	2,820	9,000	11.8	1,062	7,938
*119	US 74 Bypass West (proposed)	--	--	--	--	35,000	72.9	25,508	9,492
106	Rocky River Rd North/SR 1514	2,100	6.0	130	1,970	4,300	5.9	252	4,048
107	Poplin Road/SR 1508	1,160	4.0	50	1,110	2,000	3.9	78	1,922
108	Ridge Road/SR 1504	1,250	4.0	50	1,200	2,500	3.9	98	2,402
109	Roanoke Church Rd/SR 1505	200	0.0	0	200	500	0.8	4	496
110	unamed private drive	1	0.0	0	1	50	0.0	0	50
111	US 601 North	9,400	50.0	4,700	4,700	17,000	54.1	9,198	7,802
112	Morgan Mill Rd/NC 200 North	5,100	15.0	770	4,330	11,000	15.0	1,648	9,352
113	Olive Branch Road/SR 1006	2,100	10.0	210	1,890	4,500	9.9	444	4,056
*120	US 74 Bypass East (proposed)	--	--	--	--	27,500	79.5	21,860	5,640
114	Walkup Avenue/SR 1751	3,400	12.0	410	2,990	6,900	4.0	276	6,624
115	US 74 East/Roosevelt Blvd	28,500	65.0	18,520	9,980	28,500	38.7	11,040	17,460
116	Summerlin Dairy Rd/SR 1962	500	7.0	40	460	1,000	6.4	64	936
117	White Store Road/SR 1003	2,500	13.0	330	2,170	3,000	12.9	386	2,614
118	Old Pageland Road/SR 1941	1,500	12.0	180	1,320	2,500	11.8	294	2,206

APPENDIX B

RECOMMENDED DESIGN STANDARDS
for
SUBDIVISION ORDINANCES

English and Metric

APPENDIX B

RECOMMENDED SUBDIVISION ORDINANCES

Definitions

I. Streets and Roads

A. Rural Roads

1. Principal Arterial - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.

3. Major Collector - A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.

4. Minor Collector - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.

5. Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Interstate, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.

3. Local Street - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multi-lane roadways designed to carry large volumes of traffic at high speeds. A freeway provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An expressway is a facility with full or partial control of access and generally with grade separations at major intersections. A parkway is for non-commercial traffic, with full or partial control of access.

2. Residential Collector Street - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. Local Residential Street - Cul-de-sacs, loop streets less than 760 meters (2500 ft) in length, or streets less than 1.6 kilometers (1.0 miles) in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. Cul-de-sac - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

5. Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

III. Subdivision

A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides of develops any land deemed to be a subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than 4 hectares (10 acres) where no street right-of-way dedication is involved, (3) the public acquisition, by purchase, of strips of land for the widening or the opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than 0.8 hectares (2 acres) into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

D. Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

I. Streets and Roads

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the municipality.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

A. Right-of-way Widths - Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

	Min. ROW	
1. Rural		
a. Principle Arterial		
Freeways	105 m	(350 ft)
Other	60 m	(200 ft)
b. Minor Arterial	30 m	(100 ft)
c. Major Collector	30 m	(100 ft)
d. Minor Collector	24 m	(80 ft)
e. Local Road	18 m[1]	(60 ft)
2. Urban		
a. Major Thoroughfare other than Freeway and Expressway	27 m	(90 ft)
b. Minor Thoroughfare	21 m	(70 ft)
c. Local Street	18 m[1]	(60 ft)
d. Cul-de-sac	Variable[2]	

The subdivider will only be required to dedicate a maximum of 30 meters (100 ft) of right-of-way. In cases where over 30 meters (100 ft) of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 30 meters (100 ft). On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than 18 meters (60 ft) in width, may be dedicated when adjoining

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[1] The desirable minimum right-of-way (ROW) is 18 meters (60 ft). If curb and gutter is provided, 15 meters (50 ft) of ROW is adequate on local residential streets.

[2] The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths - Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential
   Curb and Gutter section: 7.8 meters (26 ft), face to face of curb
   Shoulder section: 6.0 meters (20 ft) to edge of pavement, 1.2 meters (4 ft) for shoulders

2. Residential Collector
   Curb and Gutter section: 10.2 meters (34 ft), face to face of curb
   Shoulder section: 6.0 meters (20 ft) to edge of pavement, 1.8 meters (6 ft) for shoulders

C. Geometric Characteristics - The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed - The design speed for a roadway should be a minimum of 10 km/h (5 mph) greater than the posted speed limit. The design speeds for subdivision type streets shall be:

TABLE 19 - DESIGN SPEEDS (METRIC)			
Facility Type	Design Speed km/h Desirable	Minimum Level	Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	100	80	60
Local roads including Residential Collectors and Local Residential (ADT Over 400)	80	80	60
URBAN			
Major Thoroughfares other than Freeway or Expressway	100	60	60
Minor Thoroughfares	100	50	50
Local Streets	50	50	30

TABLE 20 - DESIGN SPEEDS (ENGLISH)			
Facility Type	Design Speed mph Desirable	Minimum Level	Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	60	50	40
Local roads including Residential Collectors and Local Residential (ADT Over 400)	50	* 50	* 40
URBAN			
Major Thoroughfares other than Freeway or Expressway	60	50	40
Minor Thoroughfares	40	30	30
Local Streets	30	**30	**20

* Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce min design speed.

**Based on projected ADT of 50-250.
(Reference NCDOT Roadway Design Manual page 1-1B)

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

TABLE 21 - MAXIMUM VERTICAL GRADE (METRIC)

Facility Type	Design Speed (km/h)	Maximum Grade (Percent) Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads*	30	7	10	12
	50	7	9	10
	65	7	8	10
	80	6	7	9
	100	5	6	8
	110	4	5	6
Local roads including Residential Collectors and Local Residential Streets*	30	-	11	16
	50	7	10	14
	65	7	9	12
	80	6	8	10
	100	5	6	-
URBAN				
Major Thoroughfares other than Freeway or Expressway	50	8	9	11
	65	7	8	10
	80	6	7	9
	100	5	6	8
Minor Thoroughfares*	30	9	12	14
	50	9	11	12
	65	9	10	12
	80	7	8	10
	100	6	7	9
	110	5	6	7
Local Streets*	30	-	11	16
	50	7	10	14
	65	7	9	12
	80	6	8	10
	100	5	6	-

* For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table.

(Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)

TABLE 22 - MAXIMUM VERTICAL GRADE (ENGLISH)				
Facility Type	Design Speed (mph)	Maximum Grade (Percent) Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads*	20	7	10	12
	30	7	9	10
	40	7	8	10
	50	6	7	9
	60	5	6	8
	70	4	5	6
Local roads including Residential Collectors and Local Residential Streets*	20	-	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	-
URBAN				
Major Thoroughfares other than Freeway or Expressway	30	8	9	11
	40	7	8	10
	50	6	7	9
	60	5	6	8
Minor Thoroughfares*	20	9	12	14
	30	9	11	12
	40	9	10	12
	50	7	8	10
	60	6	7	9
	70	5	6	7
Local Streets*	20	-	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	-

b. Minimum grade should not be less than 0.5% .

c. Grades for 30 meters (100 ft) each way from intersections (measured from edge of pavement) should not exceed 5%.

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* For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table.

(Reference NCDOT Roadway Design Manual page 1-12 T-3)

3. Minimum Sight Distance - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters:

TABLE 23 - SIGHT DISTANCE (METRIC)

Design Speed (km/h)	30	50	60	90	100
Stopping Sight Distance					
Minimum (meters)	29.6	57.4	74.3	131.2	157.0
Desirable (meters)	30	70	90	170	210
Minimum K* Value for:					
Crest curve	3	9	14	43	62
Sag curve	4	11	15	30	37
Passing Sight Distance:					
Minimum Passing Dist for two lanes, in m	*	*	*	*	*

(General practice calls for vertical curves to be multiples of 10 meters. Calculated lengths shall be rounded up in each case.)
* Currently under revision.
(Reference NCDOT Roadway Metric Design Manual page 1-12 T-1)

TABLE 24 - SIGHT DISTANCE (ENGLISH)

Design Speed, MPH	30	40	50	60
Stopping Sight Distance:				
Minimum (ft.)	200	275	400	525
Desirable (ft.)	200	325	475	650
Minimum K* Value for:				
Crest Curve	30	60	110	190
Sag Curve	40	60	90	120
Passing Sight Distance:				
Minimum Passing Distance for 2 lanes, in feet	1,100	1,500	1,800	2,100

(General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)
(Reference NCDOT Roadway Design Manual page 1-12 T-1)

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* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

4. The "Superelevation Table" shown below shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

TABLE 25
SUPERELEVATION TABLE (METRIC)

Design Speed	Maximum e*	Minimum Radius m
50 km/h	0.04	100
65	0.04	175
80	0.04	280
100	0.04	490
50	0.06	90
65	0.06	160
80	0.06	250
100	0.06	435
50	0.08	80
65	0.08	145
80	0.08	230
100	0.08	395

*e = rate of roadway superelevation, meter per meter

TABLE 26 - SUPERELEVATION TABLE (ENGLISH)

Design Speed	Maximum e**	Minimum Radius ft.	Max. Deg. of Curve
30 mph	0.04	302	19 00′
40	0.04	573	10 00′
50	0.04	955	6 00′
60	0.04	1,637	3 45′
30	0.06	273	21 00′
40	0.06	521	11 15′
50	0.06	955	6 45
60	0.06	1,432	4 15′
30	0.08	260	22 45′
40	0.08	477	12 15′
50	0.08	819	7 30′
60	0.08	1,146	4 45′

**e = rate of roadway superelevation, foot per foot
(Reference NCDOT Roadway Design Manual page 1-12 T-6 thru T-8)

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 60 meters (200 ft) between survey center lines.

E. Cul-de-sacs

Cul-de-sacs shall not be more than 150 meters (500 ft) in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least 6.0 meters (20 ft).

3. Dead end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead end as may be required by the Planning Board.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 9.0 meters (30 ft) from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 1.8 meters (6 ft) from the face of curb.

I. Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

a. Shoulder section approach

i. Under 800 ADT design year

Minimum 8.4 meters (28 ft) width face to face of parapets, rails, or pavement width plus 3.0 meters (10 ft), whichever is greater.

ii. 800 - 2000 ADT design year

Minimum 10.2 meters (34 ft) width face to face of parapets, rails, or pavement width plus 3.6 meters (12 ft), whichever is greater.

iii. Over 2000 ADT design year

Minimum width of 12 meters (40 ft), desirable width of 13.2 meters (44 ft) width face to face of parapets or rails.

b. Curb and gutter approach

i. Under 800 ADT design year

Minimum 7.2 meters (24 ft) face to face of curbs.

ii. Over 800 ADT design year

Width of approach pavement measured face to face of curbs.

Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 450 millimeters (1' 6"), or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

a. Shoulder section approach - Width of approach pavement plus width of usable shoulders on the approach left and right. (Shoulder width 2.4 m (8 ft) minimum, 3.0m (10 ft) desirable.)

b. Curb and gutter approach - Width of approach pavement measured face to face of curbs.

Note: English equivalents are printed in this report merely as a guide. The English measurements were not meant to represent exact conversions, and should not be used for standards, regulations, or construction. The tables in this section were taken from the Roadway Design Metric Design Manual. In the event of conflicting information, the Standard Specifications for Roads and Structures and the Roadway Design Metric Design Manual should serve as the standard.

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APPENDIX C

THOROUGHFARE PLAN
STREET INVENTORY AND RECOMMENDATIONS

General Assumptions and Legend

Street Inventory

Thoroughfare Plan Map

Typical Thoroughfare Cross Sections

MONROE THOROUGHFARE PLAN
STREET INVENTORY AND RECOMMENDATIONS

The following recommendations are based on the "Mutually Adopted Thoroughfare Plan." The 2020 design year traffic volumes reflect the expected traffic patterns assuming a completely implemented thoroughfare plan. Since projects will be constructed in stages, variations in these patterns should be expected.

GENERAL ASSUMPTIONS

1. We try to achieve LOS "C" on new facilities, and LOS "D" on existing routes where prudent and feasible.

2. The planning area is anticipated to be mostly urban by the year 2020; therefore, ultimate recommendations should be curb and gutter sections, even though they may be rural areas today.

3. Widening is recommended not only for capacity deficiency, but also for system deficiencies, route continuity, level of service, adequate turn lanes, and expected growth toward the Charlotte area outside the current planning area boundary.

4. Right-of-way recommendations may include provisions for safety, City setback requirements, sidewalks, utilities (gas, electric, water, sewer, cable, telephone, lighting) drainage, and traffic signing.

5. The "TYPICAL THOROUGHFARE CROSS SECTIONS" can be modified to meet specific project location limitations such as insufficient right-of-way.

LEGEND

ADQ = Adequate as is

ULT = Ultimate cross section

LP = Lanes with parking

X/BIKE = Basic cross section, but fitted for bicycle lanes

NA = Information not available

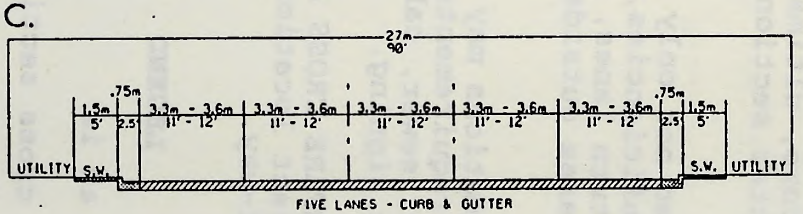
PROGRAMMED = Project in the NCDOT Transportation Improvement Program

PROPOSED = Proposed project on new location

METRIC CONVERSION TABLE		
1 foot	equals	0.3 meters
1 meter	equals	3.28 feet
1 kilometer	equals	0.62 miles
1 mile	equals	1.6 kilometers
12 feet	equals	3.6 meters

TYPICAL THOROUGHFARE CROSS SECTIONS

C.



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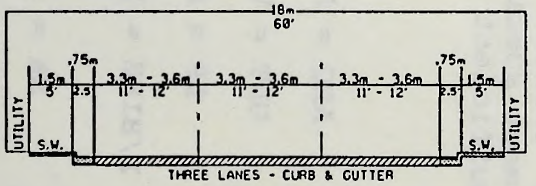
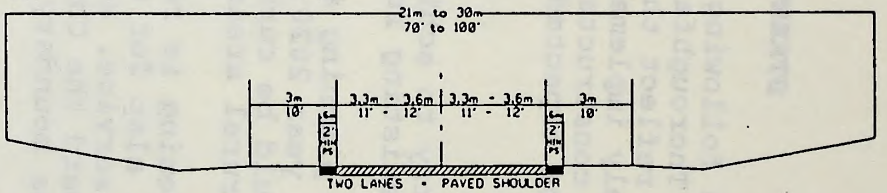


K.



TYPICAL "PRACTICAL CAPACITIES"

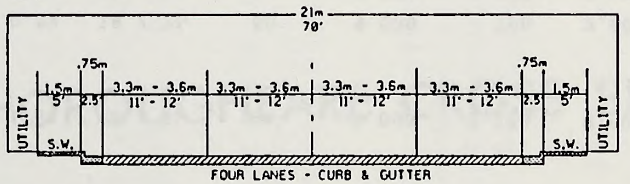
2 lane/24' = 12,000	3 lane C&G = 14,000	2 lane/oneway = 16,000	4 lane divided = 30,000 (Roosevelt Blvd)
/22' = 11,000	4 lane C&G = 22,000	3 lane/oneway = 22,000	6 lane divided = 42,000 (Roosevelt Blvd)
/20' = 10,000	5 lane C&G = 28,000		4 lane divided (freeway) = 50,000
/18' = 9,000	7 lane C&G = 40,000	(ULT) = Ultimate Design	
		P = with parking	

MONROE
Street Inventory and Recommendations

FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Airport Road (SR 1349)									
Charlotte Hwy - Airport Rd Ext	0.49	24 / 2L	NA	12,000	5,000	23,000	C	100	28,000
Airport Rd Ext - Goldmine Rd	1.14	24 / 2L	NA	12,000	1,800	14,000	C	100	28,000
Goldmine Rd - NC 84	1.40	18 / 2L	NA	9,000	NA	8,000	ADQ	ADQ	9,000
Allen Street (SR 1245)									
Charlotte Ave - Skyway Dr	0.23	52 / 4L	NA	24,000	NA	4,000	ADQ	ADQ	24,000
Baucom Deese Road (SR 1504)									
US 601 N - Morgan Mill Rd	1.68	18 / 2L	NA	9,000	2,100	3,500	ADQ	ADQ	9,000
Bivens Road (SR 1763)									
Walkup Ave - Stitt St	0.89	18 / 2L	60	9,000	700	2,600	ADQ	ADQ	9,000
Stitt St - US 74E	0.32	18 / 2L	60	9,000	1,900	5,000	ADQ	ADQ	9,000
extension to Old Pageland Rd	0.80	PROPOSED		--	--	4,000	K	100	12,000
Charles Street (SR 2188)									
Franklin St - Houston St	0.16	20 / 2L	40	8,000	2,900	9,200	H	60	14,000
Houston St - Sunset Dr	0.42	20 / 2L	30	8,000	2,900	6,500	H	60	14,000

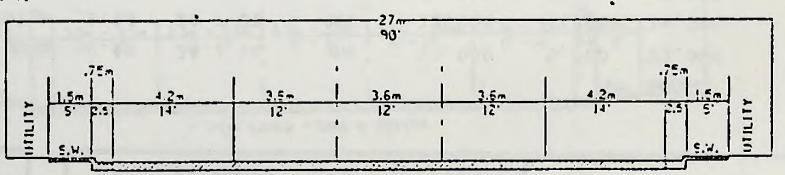
TYPICAL THOROUGHFARE CROSS SECTIONS

G.



FOUR LANES - CURB & GUTTER

N.



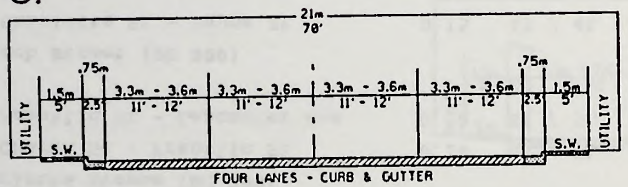
FIVE-LANE ROADWAY WITH CURB & GUTTER.
STANDARD INSIDE LANES & WIDENED CURB LANES

MONROE
Street Inventory and Recommendations

FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Old Charlotte Highway (SR 1009)									
Western PB - Rogers Rd	0.76	24 / 2L	60	12,000	8,100	17,000	N	100	28,000
Rogers Rd - Airport Rd	0.38	24 / 2L	60	12,000	9,000	22,000	N	100	28,000
Airport Rd - Rocky River Rd	0.75	24 / 2L	60	12,000	13,500	30,000	N	100	28,000
Rocky River Rd - Dickerson Blvd	2.76	24 / 2L	60	12,000	12,500	24,000	N	100	28,000
Charlotte Avenue (SR 1009)									
Dickerson Blvd - Engleside St	0.63	24 / 2L	60	12,000	14,000	17,000	N	100	28,000
Engleside St - Phifer St	0.20	26 / 2L	60	12,000	NA	17,000	N	90	28,000
Phifer St - Kenmore St	0.16	26 / 2L	50	12,000	NA	15,000	N	90	28,000
Kenmore St - Concord Ave	0.10	26 / 2L	40	12,000	NA	15,000	N	90	28,000
Concord Ave - Allen St	0.15	30 / 2L	42	12,000	16,000	20,000	N	90	28,000
Allen St - Church St	0.23	24 / 2L	40	12,000	18,000	22,000	N	90	28,000
Charlotte Avenue (NC 200)									
Church St - Franklin St	0.14	64 / 5L	90	28,000	NA	22,000	ADQ	ADQ	28,000
Franklin St - Lancaster Ave	0.30	64 / 5L	90	28,000	NA	10,000	ADQ	ADQ	28,000
Church Street (NC 200)									
Charlotte St - Hayne St	0.15	48 / 4L	70	20,000	6,000	10,000	ADQ	ADQ	20,000
Circle Drive (SR 2102)									
Sunset Dr - Franklin St	0.49	20 / 2L	50	10,000	2,100	2,500	ADQ	100	9,000
Concord Avenue (SR 1565)									
Roosevelt Blvd - Patton Ave	0.22	23 / 2L	60	12,000	12,000	15,000	G/BIKE	70	22,000
Patton Ave - Pedro St	0.13	22 / 2L	40	12,000	12,000	15,000	G/BIKE	70	22,000
Pedro St - Tucker St	0.39	24 / 2L	46	12,000	NA	13,000	G/BIKE	70	22,000
Tucker St - Walnut St	0.10	20 / 2L	40	12,000	NA	13,000	G/BIKE	70	22,000
Walnut St - Charlotte Ave	0.01	28 / 2L	40	12,000	NA	13,000	G/BIKE	70	22,000

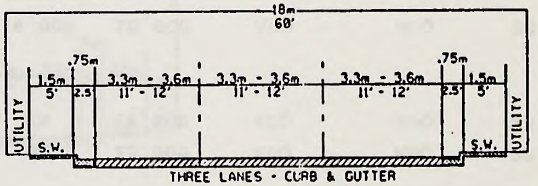
TYPICAL THOROUGHFARE CROSS SECTIONS

G.



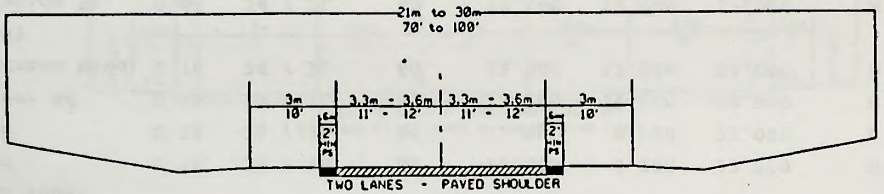
FOUR LANES - CURB & GUTTER

H.



THREE LANES - CURB & GUTTER

K.



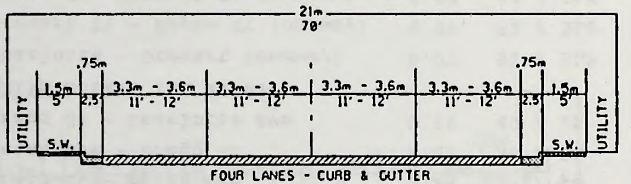
TWO LANES - PAVED SHOULDER

MONROE
Street Inventory and Recommendations

FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Dickerson Boulevard (SR 1223)									
Old Charlotte - Roosevelt Blvd	0.69	68 / 5L	100	28,000	8,400	26,000	ADQ	ADQ	28,000
East Avenue									
US 601 N - Stafford St Ext	0.59	21 / 2L	60	10,000	1,400	2,500	ADQ	ADQ	10,000
Fowler Road (SR 1503)									
Secrest Short Cut - Ridge Rd	1.20	18 / 2L	NA	9,000	1,100	2,000	ADQ	ADQ	9,000
Fowler-Secrest Road									
Roosevelt Blvd - 0.65 miles	0.65	20 / 2L	NA	10,000	NA	3,500	ADQ	ADQ	10,000
0.65 - Secrest Short Cut Rd	0.85	PROPOSED	--	--	--	3,000	K	100	12,000
Franklin Street (NC 75/84)									
NC 75/84 junction - Craig St	0.52	25 / 2L	60	12,000	13,000	14,500	(G)/BIKE	70	(22,000)
Craig St - Welsh Ave	0.14	27 / 2L	42	12,000	13,000	15,000	(G)/BIKE	70	(22,000)
Welsh Ave - Bragg St	0.09	38 / 2L	52	14,000	NA	16,000	(G)/BIKE	70	(22,000)
Bragg St - Charlotte Ave	0.39	40 / 2L	58	14,000	11,400	14,000	(G)/BIKE	70	(22,000)
Franklin Street (SR 2100)									
Charlotte - Stewart (oneway)	0.07	52 / 3LP	77	22,000	NA	8,000	ADQ	ADQ	22,000
Stewart St - Hayne St (oneway)	0.08	52 / 3LP	79	22,000	NA	8,000	ADQ	ADQ	22,000
Hayne St - Church St (oneway)	0.08	48 / 3LP	72	22,000	11,000	11,000	ADQ	ADQ	22,000
Church - Jefferson St (oneway)	0.13	44 / 2LP	58	16,000	11,000	11,000	H/BIKE	60	22,000
Jefferson St - Windsor St	0.14	36 / 2L	47	16,000	12,100	18,000	G/BIKE	70	22,000
Windsor St - Charles St	0.15	36 / 2L	50	16,000	NA	20,000	G/BIKE	70	22,000
Charles St - Circle Dr	0.59	36 / 2L	50	16,000	12,500	16,000	G/BIKE	70	22,000
Circle Dr - Sunset Dr	0.47	36 / 2L	50	16,000	NA	16,000	G/BIKE	70	22,000
Sunset Dr - Roosevelt Blvd	0.38	36 / 2L	50	16,000	11,200	15,000	G/BIKE	70	22,000

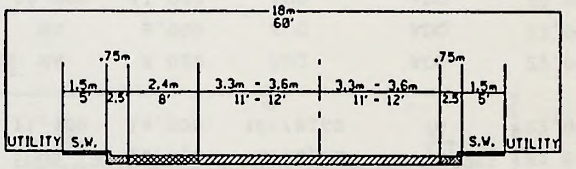
TYPICAL THOROUGHFARE CROSS SECTIONS

G.



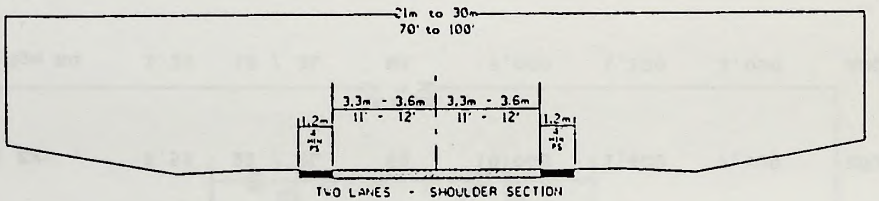
FOUR LANES - CURB & GUTTER

J.



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

O.



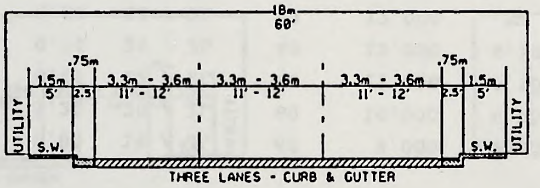
TWO LANES - SHOULDER SECTION

MONROE
Street Inventory and Recommendations

FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Gold Mine Road (SR 1162)									
Western PB - Airport Rd	1.22	20 / 2L	60	10,000	1,300	6,000	ADQ	ADQ	10,000
Airport Rd - Rocky River Rd	1.45	20 / 2L	60	10,000	2,000	9,000	(G)	90	(22,000)
Rocky River Rd - Western Loop	2.22	20 / 2L	60	10,000	2,300	11,300	(G)	90	(22,000)
Western Loop - Iceman Connector	0.40	20 / 2L	60	10,000	1,500	3,000	ADQ	ADQ	10,000
Connector to Iceman St	0.14	PROPOSED	--	--	--	3,000	J	60	10,000
Griffith Road (SR 2139)									
Southern PB - Western Loop	0.64	20 / 2L	60	10,000	2,800	4,000	(O)	(80)	(12,000)
Western Loop - Ridgewood Dr	0.96	20 / 2L	60	10,000	3,200	4,700	(O)	(80)	(12,000)
Ridgewood - Sunset Dr	0.80	24 / 2L	60	12,000	3,200	5,900	(O)	(80)	12,000
Sunset Dr - Johnson St	0.11	36 / 2L	49	12,000	NA	5,900	ADQ	ADQ	12,000
Johnson St - Lancaster Ave	0.21	27 / 2L	49	12,000	3,800	6,000	ADQ	ADQ	12,000
Hayne Street (NC 207 South)									
Southern PB - Stack Rd	0.80	18 / 2L	60	9,000	2,900	5,300	ADQ	ADQ	9,000
Stack Rd - Maurice St	1.20	20 / 2L	60	10,000	6,000	9,400	ADQ	ADQ	10,000
Maurice St - Church St	0.46	22 / 2L	60	11,000	6,100	11,000	ADQ	ADQ	11,000
Church St - Houston St	0.74	26 / 2L	40	12,000	6,100	11,000	ADQ	ADQ	12,000
Houston St - Morrow Ave	0.06	34 / 2L	47	12,000	NA	12,000	ADQ	ADQ	12,000
Morrow Ave - Talleyrand Ave	0.07	39 / 2L	63	12,000	NA	12,000	ADQ	ADQ	12,000
Talleyrand Ave - Correll St	0.04	43 / 2LP	69	12,000	NA	12,000	ADQ	ADQ	12,000
Correll St - Windsor St	0.04	45 / 2LP	73	12,000	6,700	12,000	ADQ	ADQ	12,000
Windsor St - Franklin St	0.07	50 / 3LP	79	14,000	6,700	12,000	ADQ	ADQ	14,000
Franklin St - Jefferson St	0.04	56 / 4LP	80	22,000	NA	12,000	ADQ	ADQ	22,000
Jefferson St - Crowell St	0.04	52 / 4L	59	22,000	NA	12,000	ADQ	ADQ	22,000
Crowell St - Church St	0.04	56 / 4L	72	22,000	NA	12,000	ADQ	ADQ	22,000

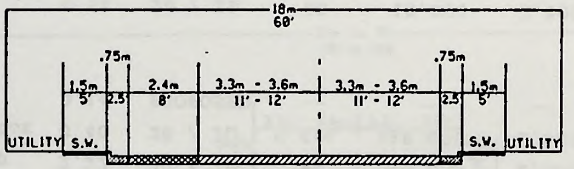
TYPICAL THOROUGHFARE CROSS SECTIONS

H.



THREE LANES - CURB & GUTTER

J.



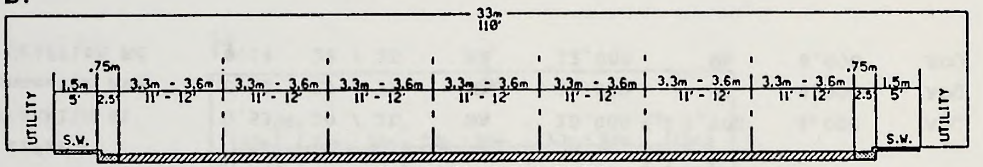
TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

MONROE
Street Inventory and Recommendations

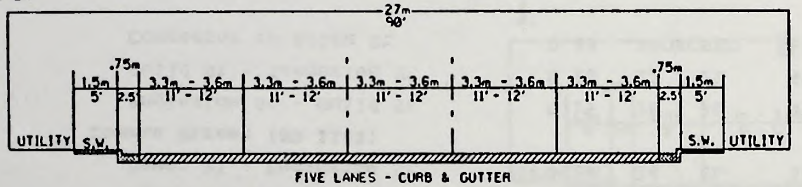
FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Houston Street (SR 2213)									
Lancaster Ave - Hayne St	0.15	24 / 2L	60	12,000	NA	6,000	ADQ	ADQ	12,000
Hayne St - Charles St	0.40	24 / 2L	60	12,000	2,300	4,000	ADQ	ADQ	12,000
Iceman Street									
Gold Mine Connector - Dover Pl	0.06	18 / 2L	40	9,000	NA	3,000	ADQ	ADQ	9,000
Dover Pl - Engleside St	0.16	24 / 2L	38	12,000	NA	3,000	ADQ	ADQ	12,000
Iceman Street (SR 1162)									
Engleside St - Guild St	0.15	28 / 2L	40	12,000	NA	3,000	ADQ	ADQ	12,000
Guild St - Icemorlee St	0.10	22 / 2L	40	11,000	NA	3,000	ADQ	ADQ	11,000
Connector to Allen St	0.48	PROPOSED	--	--	--	4,000	J	60	10,000
Jefferson Street									
Franklin St - Depot St (oneway)	0.09	40 / 3L	80	22,000	NA	8,000	ADQ	ADQ	22,000
Depot St - Hayne St (oneway)	0.18	52 / 4L	80	22,000	NA	8,000	ADQ	ADQ	22,000
Hayne St - Main St (oneway)	0.04	52 / 3LP	79	22,000	NA	6,000	ADQ	ADQ	22,000
Main - Stewart St (oneway)	0.04	52 / 3LP	77	22,000	NA	6,000	ADQ	ADQ	22,000
Stewart - Charlotte Ave (oneway)	0.06	52 / 3LP	73	22,000	NA	6,000	ADQ	ADQ	22,000
Johnson Street (SR 1162)									
Icemorlee St - Franklin St	0.53	20 / 2L	NA	10,000	3,700	4,000	ADQ	ADQ	10,000
Franklin St - Lancaster Ave	0.52	27 / 2L	NA	12,000	NA	4,000	ADQ	ADQ	12,000
Lancaster Ave - Griffith Rd	0.14	28 / 2L	NA	12,000	NA	6,000	ADQ	ADQ	12,000
Lancaster Ave (NC 200 S)									
Southern PB - Southern Loop	0.23	22 / 2L	60	11,000	5,000	11,000	H/BIKE	80	14,000
Southern Loop - Western Loop	0.87	22 / 2L	60	11,000	6,900	12,000	H/BIKE	80	14,000
Western Loop - Johnson St	1.70	24 / 2L	60	12,000	9,200	11,000	H/BIKE	80	14,000
Johnson St - Washington St	0.31	26 / 2L	60	12,000	8,800	12,000	H/BIKE	80	14,000
Washington St - Charlotte Ave	0.03	42 / 2L	60	12,000	8,800	13,500	H/BIKE	80	14,000

TYPICAL THOROUGHFARE CROSS SECTIONS

B.



C.



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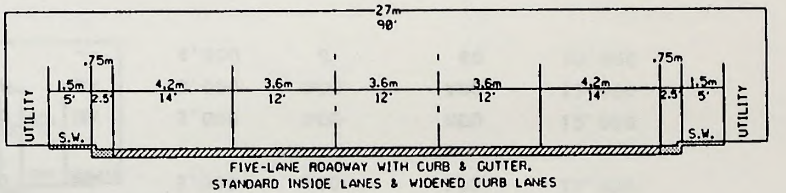
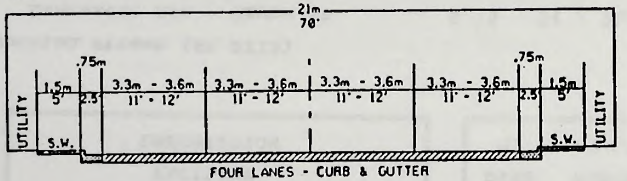


G.



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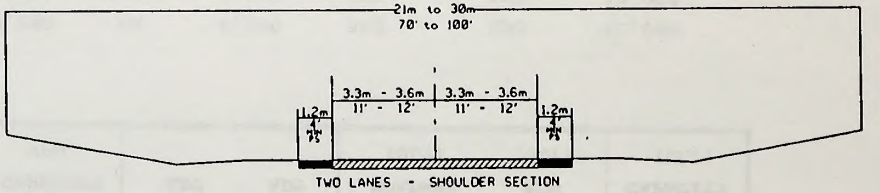
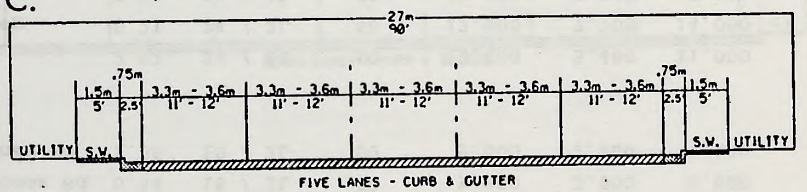


MONROE
Street Inventory and Recommendations

FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Medlin Road (SR 2102)									
Southern PB - Southern Loop	0.32	16 / 2L	60	7,000	1,000	1,800	(O)	(80)	(12,000)
Southern Loop - Sunset Dr	1.48	16 / 2L	60	7,000	1,400	2,200	(O)	(80)	(12,000)
Morgan Mill Road (NC 200 North)									
Northern PB - US 74 Bypass	2.00	22 / 2L	60	11,000	5,600	11,000	ADQ	ADQ	11,000
US 74 Bypass - Olive Branch Rd	0.85	22 / 2L	60	11,000	5,200	19,000	N	100	28,000
Olive Branch - Sutherland Ave	0.66	22 / 2L	60	11,000	7,400	32,000	B/BIKE	110	40,000
Sutherland - Roosevelt Blvd	0.42	25 / 2L	60	12,000	8,500	28,000	B/BIKE	110	40,000
Morgan Mill Road (SR 2188)									
Roosevelt - Winchester Ave	0.37	20-27-40	80-130-180	12,000	11,700	17,000	C	ADQ	28,000
Winchester - Franklin St	0.41	52-64	80-180	22,000	11,700	19,000	C	ADQ	28,000
New Town Road (SR 1315)									
Western PB - Fletcher Broome Rd	0.64	18 / 2L	60	9,000	2,800	5,000	ADQ	ADQ	9,000
Fletcher Broome Rd - Waxhaw Rd	1.80	18 / 2L	60	9,000	2,400	4,000	ADQ	ADQ	9,000
NC 75 West (Waxhaw Road)									
Western PB - New Town Rd	2.52	24 / 2L	60	12,000	5,400	11,000	O	80	12,000
New Town Rd - Western Loop	0.21	24 / 2L	60	12,000	7,700	14,000	G	80	22,000
Western Loop - NC 84	0.45	24 / 2L	60	12,000	7,700	8,000	O	80	12,000
NC 84 West (Weddington Road)									
Western PB - Airport Rd	0.34	22 / 2L	100	11,000	4,600	10,000	O	ADQ	12,000
Airport Rd - Willoughby Rd	1.63	22 / 2L	100	11,000	NA	4,000	O	ADQ	12,000
Willoughby - Rocky River Rd	0.79	22 / 2L	100	11,000	4,000	7,500	O	ADQ	12,000
Rocky River - Western Loop	1.89	22 / 2L	100	11,000	4,000	11,000	O	ADQ	12,000
Western Loop - NC 75	0.51	22 / 2L	100	11,000	4,300	6,500	O	ADQ	12,000

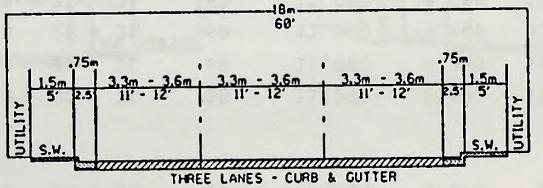
TYPICAL THOROUGHFARE CROSS SECTIONS

C.



FIVE LANES - CURB & GUTTER

H.



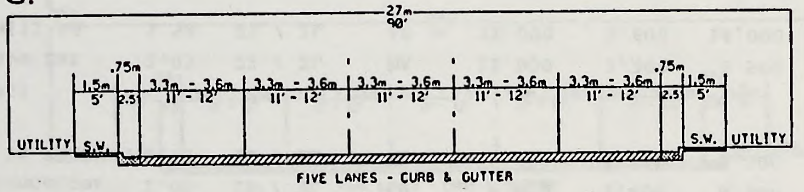
THREE LANES - CURB & GUTTER

MONROE
Street Inventory and Recommendations

FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Northern Loop									
Roosevelt - Secrest Short Cut	0.19	PROPOSED	--	--	--	20,500	C	100	28,000
Secrest Short Cut - US 601 N	0.81	PROPOSED	--	--	--	16,600	C	100	28,000
US 601 N - Stafford St Ext	0.64	PROPOSED	--	--	--	6,700	H	100	14,000
Stafford - Morgan Mill Rd	0.85	20 / 2L	NA	10,000	1,600	5,000	H	100	14,000
Morgan Mill - Olive Branch Rd	0.11	PROPOSED	--	--	--	7,500	H	100	14,000
Olive Branch - Secrest Extension	1.06	PROPOSED	--	--	--	9,000	H	100	14,000
Secrest Ave Ext - Walkup Ave	1.06	PROPOSED	--	--	--	5,300	H	100	14,000
Old Highway 74 (SR 1964)									
US 601 S - Old Pageland Rd	0.95	18 / 2L	60	9,000	1,400	2,000	ADQ	ADQ	9,000
Old Pageland Road (SR 1941)									
Southern PB - White Store Rd	0.76	18 / 2L	60	9,000	1,800	2,500	(H)	(80)	(14,000)
White Store - Bivens Connector	1.00	18 / 2L	60	9,000	1,400	8,900	(H)	(80)	(14,000)
Bivens Connector - US 74 East	0.70	18 / 2L	60	9,000	1,600	5,300	(H)	(80)	(14,000)
Olive Branch Road (SR 1006)									
Eastern PB - Secrest Ave Ext	2.03	22 / 2L	NA	11,000	2,200	5,500	ADQ	ADQ	11,000
Secrest Ext - Morgan Mill Rd	1.52	22 / 2L	60	11,000	2,600	14,000	C	100	28,000
Phifer Street									
Stafford St - Skyway Dr	0.33	45 / 4L	60	22,000	500	3,000	ADQ	ADQ	22,000
Skyway Dr - Cherry St	0.22	21 / 2L	30	10,000	1,900	4,000	ADQ	ADQ	10,000
Cherry St - Charlotte Ave	0.27	24 / 2L	33	12,000	1,900	4,000	ADQ	ADQ	12,000
Poplin Road (SR 1508)									
Northern PB - Secrest Short Cut	0.95	18 / 2L	NA	9,000	1,100	3,000	ADQ	ADQ	9,000

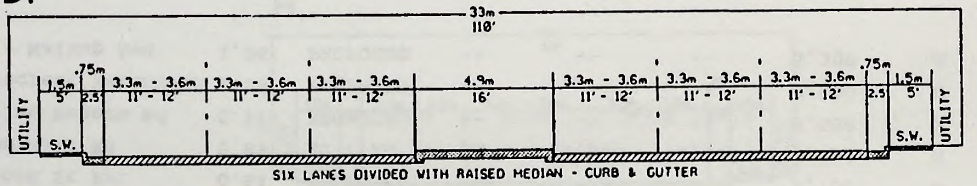
TYPICAL THOROUGHFARE CROSS SECTIONS

C.



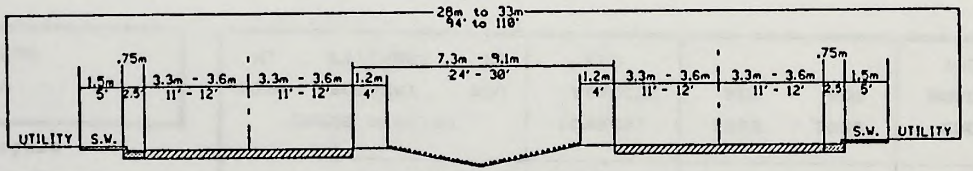
FIVE LANES - CURB & GUTTER

D.



SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



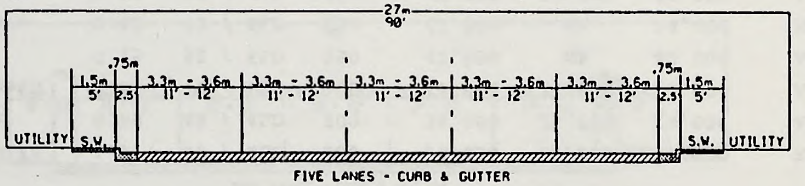
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

MONROE
Street Inventory and Recommendations

FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Ridge Road (SR 1504)									
SR 1505 - Fowler Rd	0.98	18 / 2L	NA	9,000	1,200	3,000	ADQ	ADQ	9,000
Fowler Rd - US 601 N	0.53	18 / 2L	NA	9,000	2,300	7,500	ADQ	ADQ	9,000
Rocky River Road (SR 1514)									
Northern PB - US 74 Bypass	0.38	20 / 2L	NA	10,000	2,300	10,000	C	100	28,000
US 74 Byp - Secrest Short Cut	0.28	20 / 2L	NA	10,000	2,300	15,000	C	100	28,000
Secrest Short - Roosevelt Blvd	1.29	20 / 2L	NA	10,000	3,300	17,000	C	100	28,000
Rocky River Road (SR 1007)									
Roosevelt - Old Charlotte Hwy	0.71	20 / 2L	50	10,000	7,600	18,000	F	100	30,000
Old Charlotte - Goldmine Rd	1.37	20 / 2L	50	10,000	6,300	15,000	F	100	30,000
Goldmine Rd - Weddington Rd	1.49	20 / 2L	50	10,000	5,500	10,000	F	100	30,000
Weddington - Southern Loop	0.75	20 / 2L	50	10,000	4,800	12,000	F	100	30,000
Southern Loop - New Town Rd	0.85	20 / 2L	50	10,000	NA	7,000	ADQ	ADQ	10,000
Rogers Road (SR 1353)									
Western PB - Old Charlotte Hwy	1.08	18 / 2L	NA	9,000	1,000	5,000	ADQ	ADQ	9,000
Roosevelt Boulevard (US 74)									
Eastern PB - Secrest Ave	1.97	48 / 4LD	200	30,000	23,100	30,000	ADQ	ADQ	30,000
Secrest - Richardson Creek	0.89	48 / 4LD	200	30,000	25,000	24,000	ADQ	ADQ	30,000
Richardson Crk - US 601 South	0.42	72 / 6LD	200	42,000	25,000	24,000	ADQ	ADQ	42,000
US 601 S - Franklin St	0.15	91 / 6LD	150	42,000	NA	40,000	ADQ	ADQ	42,000
Franklin St - Sutherland Ave	0.42	72 / 6LD	150	42,000	NA	28,000	ADQ	ADQ	42,000
Sutherland -Walkup Ave	0.52	72 / 6LD	150	42,000	32,000	33,000	ADQ	ADQ	42,000
Walkup Ave - Morgan Mill Rd	0.23	72 / 6LD	150	42,000	39,700	35,000	ADQ	ADQ	42,000
Morgan Mill Rd - Stafford St	0.83	72 / 6LD	130	42,000	42,800	38,000	ADQ	ADQ	42,000
Stafford St - US 601 North	0.40	72 / 6LD	150	42,000	44,400	41,000	ADQ	ADQ	42,000
US 601 North - Concord Ave	0.27	72 / 6LD	200	48,000	45,800	46,000	ADQ	ADQ	48,000
Concord Ave - Dickerson Blvd	0.58	72 / 6LD	200	42,000	36,000	38,000	ADQ	ADQ	42,000
Dickerson - Rocky River Rd	3.22	50 / 4LD	230	30,000	31,000	34,500	D	ADQ	42,000
Rocky River Rd - Western PB	1.33	50 / 4LD	230	30,000	34,000	39,000	D	ADQ	42,000

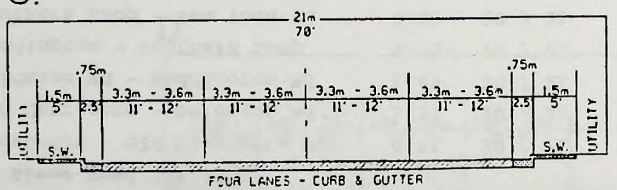
TYPICAL THOROUGHFARE CROSS SECTIONS

C.



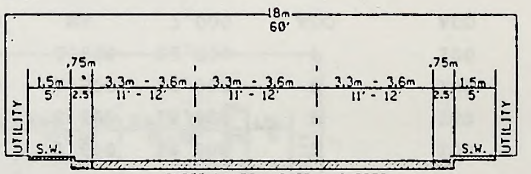
FIVE LANES - CURB & GUTTER

G.



FOUR LANES - CURB & GUTTER

H.



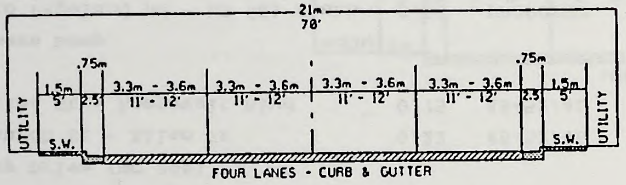
THREE LANES - CURB & GUTTER

MONROE
Street Inventory and Recommendations

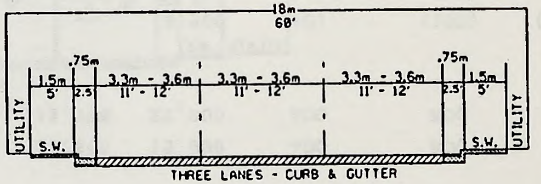
FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Secrest Avenue									
Olive Branch Rd - US 74 Bypass	0.61	PROPOSED	--	--	--	11,400	C	100	28,000
US 74 Bypass - Bravo Place	0.66	PROPOSED	--	--	--	19,500	C	100	28,000
Bravo Place - Walkup Ave	0.34	24 / 2L	NA	12,000	NA	20,000	C	100	28,000
Walkup Ave - Roosevelt Ave	0.95	23 / 2L	50	12,000	4,000	18,000	C	100	28,000
Secrest Short Cut Rd (SR 1501)									
Northern PB - Rocky River Rd	0.28	18 / 2L	60	9,000	4,000	9,000	H	80	14,000
Rocky River Rd - Poplin Rd	1.55	18 / 2L	60	9,000	4,400	7,000	H/BIKE	80	14,000
Poplin Rd - Northern Loop	1.74	18 / 2L	60	9,000	4,800	7,500	H/BIKE	80	14,000
Northern Loop - Roosevelt Blvd	0.27	18 / 2L	60	9,000	7,500	8,000	H/BIKE	80	14,000
Skyway Drive (NC 200)									
Church St - Allen St	0.22	48-52/4L	70	22,000	11,800	15,000	ADQ	ADQ	22,000
Allen St - Roosevelt Blvd	0.75	48-52/4L	NA	22,000	11,700	21,000	ADQ	ADQ	22,000
Southern Loop									
Old Pageland Rd - US 601 South	0.85	PROPOSED	--	--	--	6,900	(G)	(100)	(22,000)
US 601 S - Medlin Rd	1.42	PROPOSED	--	--	--	3,100	(G)	(100)	(22,000)
Belmont Church Road (SR 2138)									
Medlin Rd - Stack Rd	1.10	18 / 2L	60	9,000	500	3,000	(G)	(100)	(22,000)
Stack Rd - NC 207 S	0.19	PROPOSED	--	--	--	3,300	(G)	(100)	(22,000)
NC 207 S - Helms Short Cut Rd	1.36	PROPOSED	--	--	--	1,300	(G)	(100)	(22,000)
along Helms Short Cut Rd	0.91	20 / 2L	60	10,000	300	1,500	(G)	(100)	(22,000)
Helms SC Rd - Fletcher Broome	0.90	PROPOSED	--	--	--	2,500	(G)	(100)	(22,000)
Fletcher Broome - Waxhaw Rd	1.36	18 / 2L	60	9,000	800	3,000	(G)	(100)	(22,000)
Waxhaw Rd - New Town Rd	0.25	20 / 2L	60	10,000	700	6,500	(G)	(100)	(22,000)
New Town Rd - Rocky River Rd	0.63	PROPOSED	--	--	--	6,700	(G)	(100)	(22,000)

TYPICAL THOROUGHFARE CROSS SECTIONS

G.



H.



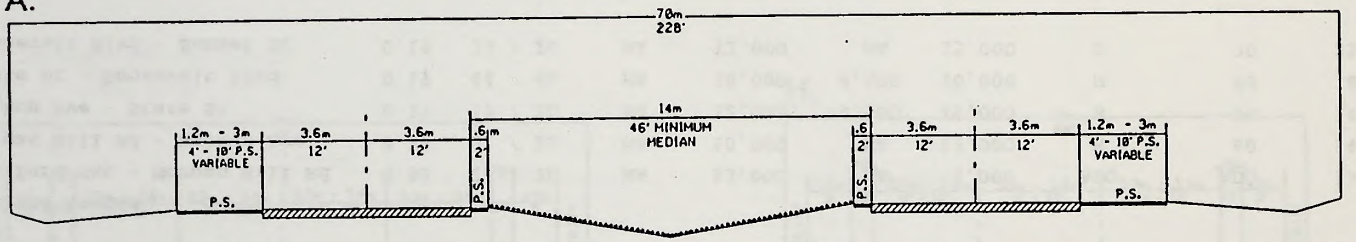
MONROE

Street Inventory and Recommendations

FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Stafford Street									
Winchester Ave - Fairley Ave	0.13	28 / 2L	40	12,000	1,000	2,500	ADQ	ADQ	12,000
Fairley - north of Adams St	0.28	21 / 2L	40	10,000	1,000	2,500	ADQ	ADQ	10,000
n of Adams - Phifer St	0.15	45 / 4L	NA	20,000	1,000	2,500	ADQ	ADQ	20,000
Phifer St - Roosevelt Blvd	0.17	45 / 4L	60	20,000	NA	5,300	ADQ	ADQ	20,000
Stafford St Extension (SR 1624)									
Roosevelt - Sutherland Ave	0.51	21 / 2L	60	10,000	2,000	2,500	ADQ	ADQ	10,000
Sutherland - Northern Loop	0.64	20 / 2L	60	10,000	1,900	2,800	ADQ	ADQ	10,000
Sunset Drive									
Sutherland Ave - Franklin St	0.22	33 / 2L	NA	12,000	NA	12,000	ADQ	ADQ	12,000
Sunset Drive (SR 2181)									
Franklin St -Circle/Medlin	0.46	24 / 2L	NA	12,000	6,900	7,500	ADQ	ADQ	12,000
Circle/Medlin - Charles St	0.80	24 / 2L	NA	12,000	6,800	8,000	ADQ	ADQ	12,000
Charles St - Hayne St	0.41	24 / 2L	NA	12,000	NA	12,500	ADQ	ADQ	12,000
Hayne St - Bickett St	0.15	24 / 2L	NA	12,000	5,200	7,000	ADQ	ADQ	12,000
Bickett St - Griffith Rd	0.23	PROPOSED	--	--	--	7,000	H	70	14,000
Sutherland Avenue									
Stafford Ext - Morgan Mill Rd	0.88	29 / 2L	NA	13,000	NA	4,000	ADQ	ADQ	13,000
Morgan Mill Rd - Walkup Ave	0.39	21 / 2L	NA	10,000	NA	13,000	H	60	14,000
Walkup Ave - State St	0.37	30 / 2L	NA	12,000	4,500	10,000	H	60	14,000
State St - Roosevelt Blvd	0.19	44 / 4L	NA	20,000	4,500	10,000	H	60	14,000
Roosevelt Blvd - Sunset Dr	0.19	33 / 2L	NA	12,000	NA	15,000	G	70	22,000

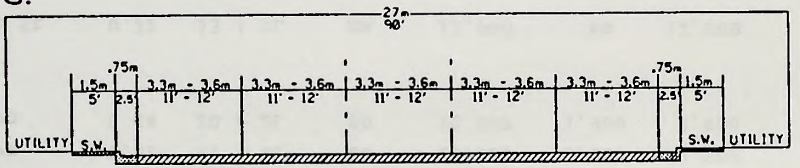
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



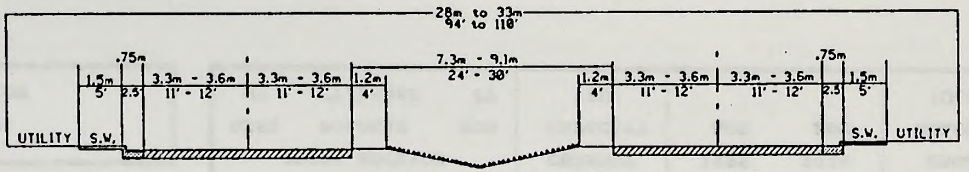
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

C.



FIVE LANES - CURB & GUTTER

F.



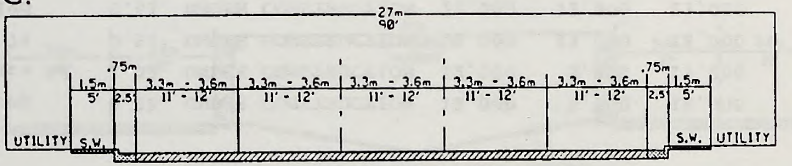
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

MONROE
Street Inventory and Recommendations

FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
US 74 Bypass									
Eastern PB - Secrest Ave Ext	2.10	PROGRAMMED	--	--	--	27,500	A	328	50,000
Secrest Ext - Morgan Mill Rd	1.14	PROGRAMMED	--	--	--	32,700	A	328	50,000
Morgan Mill Rd - US 601 North	1.70	PROGRAMMED	--	--	--	39,000	A	328	50,000
US 601 North - Rocky River Rd	3.60	PROGRAMMED	--	--	--	28,000	A	328	50,000
Rocky River Rd - Western PB	0.38	PROGRAMMED	--	--	--	35,000	A	328	50,000
US 601 North									
Northern PB - Baucom Deese Rd	0.72	24 / 2L	100	12,000	8,500	17,000	F/BIKE	ADQ	30,000
Baucom Deese - US 74 Bypass	0.32	32 / 2L	120	12,000	10,900	21,500	F/BIKE	ADQ	30,000
US 74 Bypass - Deese Rd	0.52	32 / 2L	120	12,000	11,000	23,600	F/BIKE	ADQ	30,000
Deese Rd - Northern Loop	0.62	32 / 2L	120	12,000	12,100	27,000	F/BIKE	ADQ	30,000
Northern Loop - East Ave	0.80	32 / 2L	120	12,000	11,400	15,500	F/BIKE	ADQ	30,000
East Ave - Roosevelt Blvd	0.11	44-52/4L	120	22,000	NA	16,000	F/BIKE	ADQ	30,000
US 601 South									
Southern PB - Southern Loop	0.28	UNDER CONSTRUCTION		12,000	9,500	18,000	C	120	28,000
Southern Loop - White Store Rd	1.02	UNDER CONSTRUCTION		12,000	9,000	13,000	C	120	28,000
White Store Rd - Old Hwy 74	0.51	UNDER CONSTRUCTION		12,000	13,000	18,000	C	120	28,000
Old Hwy 74 - Roosevelt Blvd	0.61	UNDER CONSTRUCTION		22,000	12,900	21,000	C	120	28,000
Walkup Avenue (SR 1751)									
Eastern PB - Bivens Rd	1.10	20 / 2L	NA	10,000	3,400	7,000	ADQ	ADQ	10,000
Bivens Rd - Secrest Ave	1.14	22 / 2L	NA	11,000	2,900	3,500	ADQ	ADQ	11,000
Secrest Ave - Richardson Creek	0.57	22 / 2L	NA	11,000	11,000	13,000	C	90	28,000
Richardson Crk - Sutherland Ave	0.85	22 / 2L	NA	11,000	11,000	15,000	C	90	28,000
Sutherland - Roosevelt Blvd	0.27	22 / 2L	NA	11,000	NA	12,000	C	90	28,000
Roosevelt - Morgan Mill Rd	0.44	24 / 2L	NA	12,000	7,500	10,000	G	80	22,000

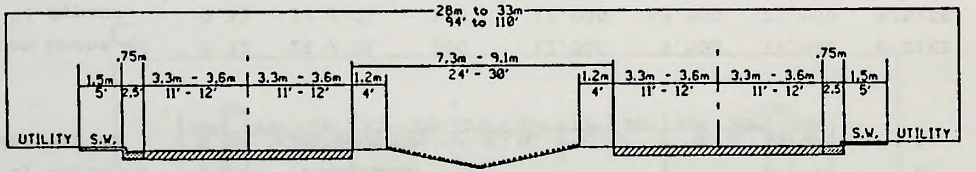
TYPICAL THOROUGHFARE CROSS SECTIONS

C.



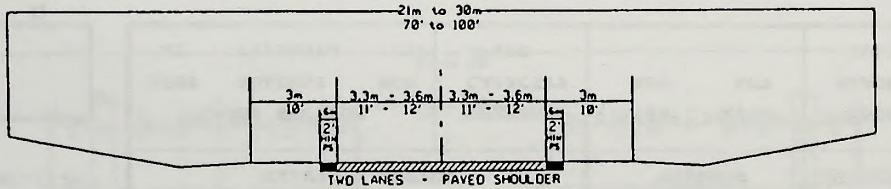
FIVE LANES - CURB & GUTTER

F.



FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

K.

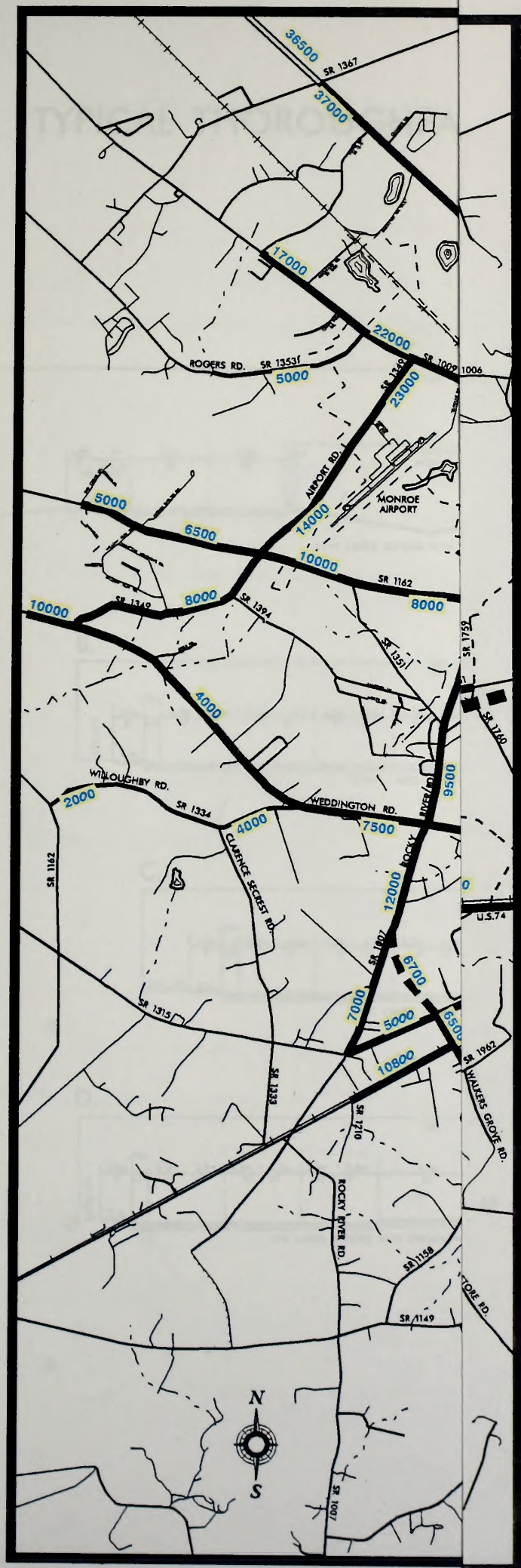


TWO LANES - PAVED SHOULDER

MONROE
Street Inventory and Recommendations

FACILITY DESCRIPTION	EXISTING SYSTEM				VOLUMES		RECOMMENDED PLAN		
	CROSS SECTION			CURRENT	1995	2020	CROSS SECTION		FUTURE
	DIST	ROADWAY	ROW	CAPACITY	ADT	ADT	ROADWAY	ROW	CAPACITY
	MI	FT/LANES	FT	VPD			(ULT)	(ULT)	(ULT)
Western Loop									
Southern Loop - Griffith Rd	1.10	PROPOSED	--	--	--	1,600	K	100	12,000
Griffith Rd - Lancaster Ave	1.29	PROPOSED	--	--	--	2,100	K	100	12,000
Lancaster Ave - NC 75	1.63	PROPOSED	--	--	--	5,000	F	100	30,000
NC 75 - NC 84	0.33	PROPOSED	--	--	--	11,000	F	100	30,000
NC 84 - Goldmine Rd	0.95	PROPOSED	--	--	--	17,000	F	100	30,000
Goldmine Rd - Charlotte Ave	0.36	PROPOSED	--	--	--	25,000	C	100	28,000
White Store Road (SR 1003)									
Eastern PB - Old Pageland Rd	0.51	20 / 2L	NA	10,000	2,500	3,000	ADQ	ADQ	10,000
Old Pageland - Southern Loop	0.28	20 / 2L	NA	10,000	2,500	4,000	ADQ	ADQ	10,000
Southern Loop - US 601 South	0.90	20 / 2L	NA	10,000	3,500	4,300	ADQ	ADQ	10,000
Willoughby Road (SR 1334)									
Western PB - Weddington Rd	1.90	18 / 2L	NA	9,000	700	2,000	ADQ	ADQ	9,000
Winchester Avenue									
Skyway Dr - Miller St	0.31	24 / 2L	50	12,000	3,600	5,000	(G)	(70)	(22,000)
Miller St - Morgan Mill Rd	0.59	21 / 2L	30	10,000	3,600	4,000	(G)	(70)	(22,000)
Windsor Street									
Morgan Mill Rd - Franklin St	0.27	27 / 2L	40	12,000	NA	6,400	ADQ	ADQ	12,000
Franklin St - Hayne St	0.32	30 / 2LP	49	12,000	4,500	5,000	ADQ	ADQ	12,000
Hayne St - Charlotte Ave	0.15	33 / 2LP	40	12,000	1,000	4,000	ADQ	ADQ	12,000

TYPICAL THOROUGHFARE CROSS SECTIONS



LEGEND

	EXISTING	PROPOSED
FREEWAY	▬▬	▬ ▬ ▬
MAJOR	▬▬	▬ ▬ ▬
MINOR	▬▬	▬ ▬ ▬
INTERCHANGE	●	◎

ADOPTED BY:

CITY OF MONROE 12-17-96

CITIZEN'S WORKSHOP 11-7-96

PUBLIC HEARING 12-3-96

RECOMMENDED BY STATEWIDE PLANNING 12-19-96

N.C. DEPARTMENT OF TRANSPORTATION 2-7-97

2020 VOLUMES

DECEMBER 17, 1996

THOROUGHFARE PLAN FOR

MONROE

UNION COUNTY NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE

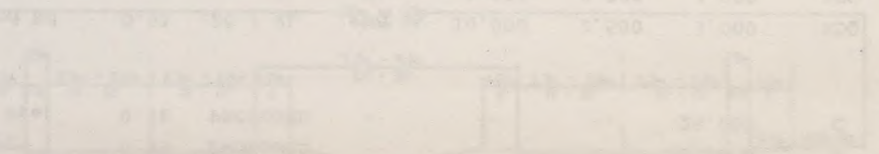
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

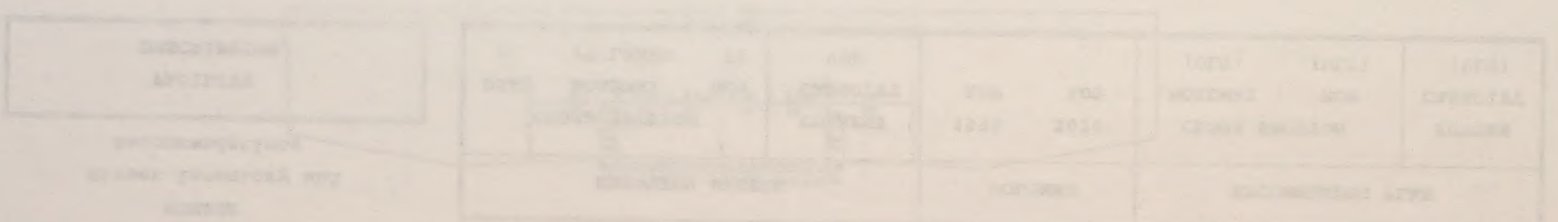
2000 0 2000 4000 6000 scale in feet

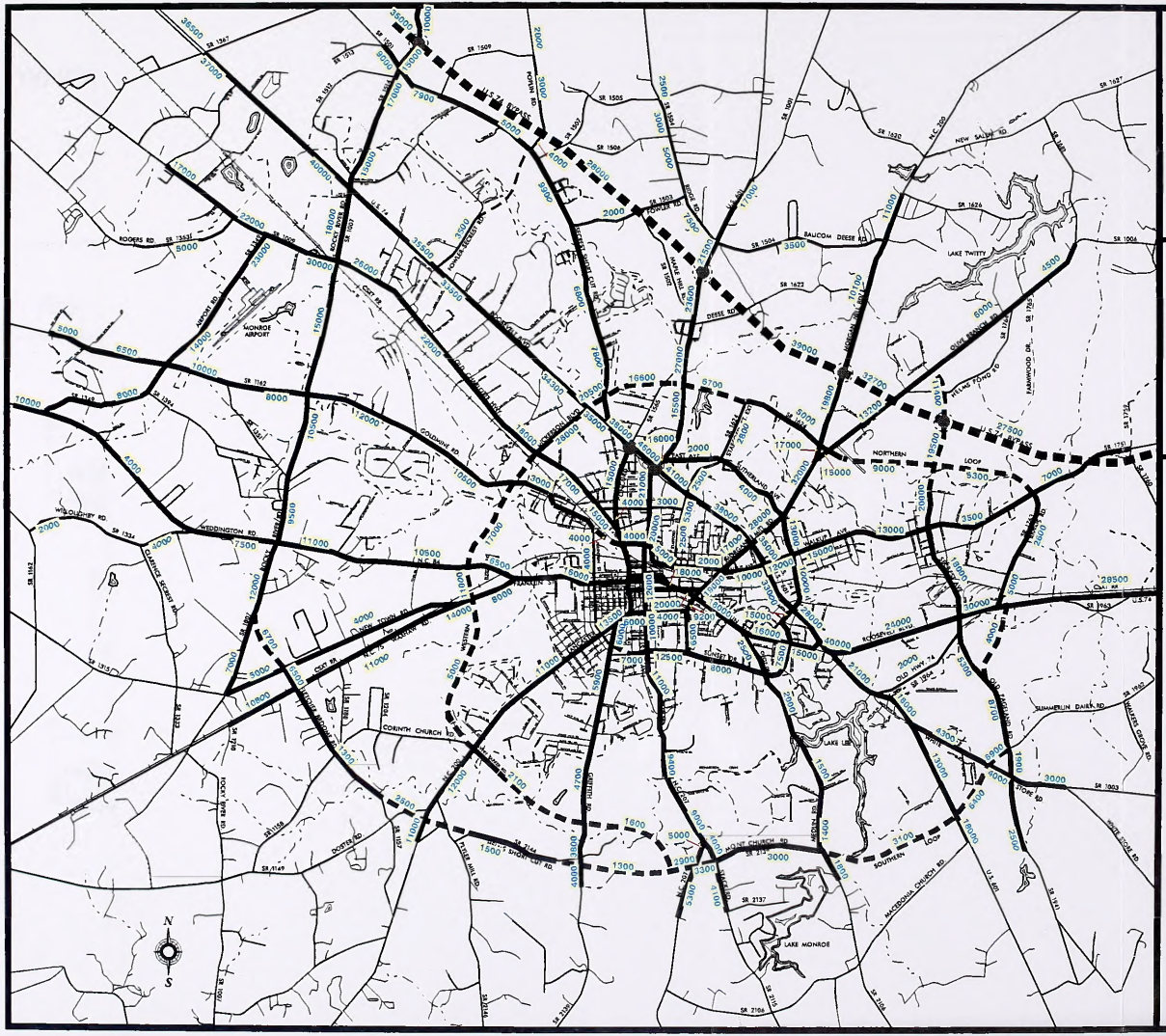
500 0 500 1000 1500 2000 scale in meters

Base Map Date
August 13, 1996

TYPICAL THOROUGHFARE CROSS SECTIONS







LEGEND

	EXISTING	PROPOSED
FREEWAY	▬▬	▬ ▬
MAJOR	▬▬	▬ ▬
MINOR	▬▬	▬ ▬
INTERCHANGE	●	☼

ADOPTED BY:

CITY OF MONROE 12-17-96

CITIZEN'S WORKSHOP 11-7-96

PUBLIC HEARING 12-3-96

RECOMMENDED BY STATEWIDE PLANNING 12-19-96

N.C. DEPARTMENT OF TRANSPORTATION 2-7-97

2020 VOLUMES

DECEMBER 17, 1996

THOROUGHFARE PLAN FOR MONROE

UNION COUNTY NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

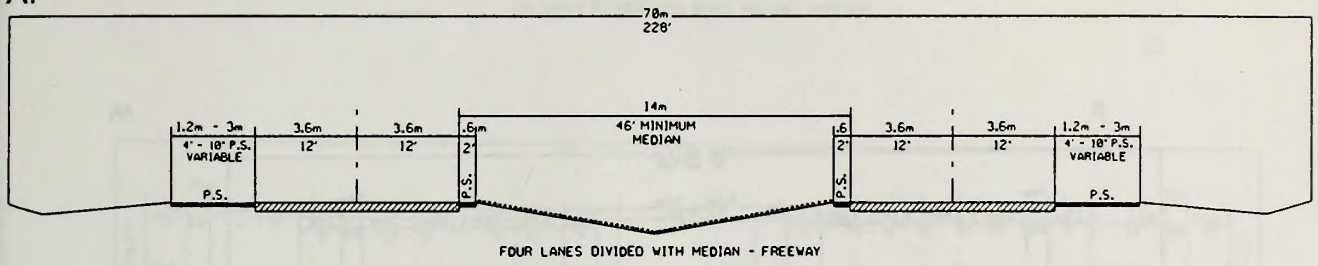
2000 0 2000 4000 6000

500 0 500 1000 1500 2000

Base Map Date
August 13, 1996

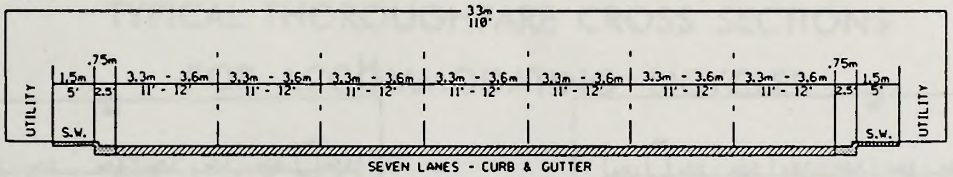
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



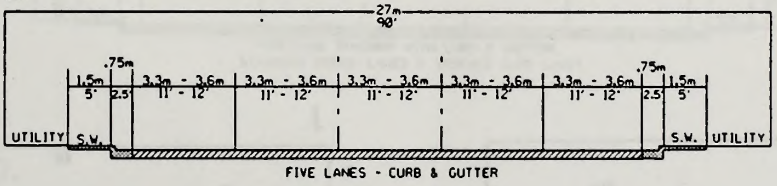
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



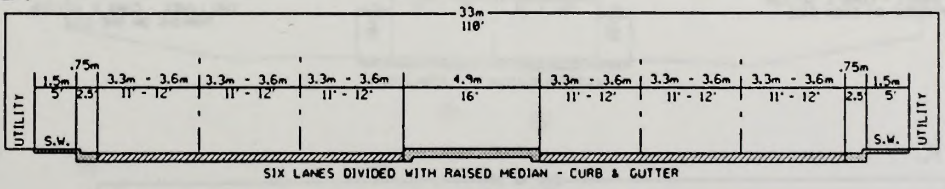
SEVEN LANES - CURB & GUTTER

C.



FIVE LANES - CURB & GUTTER

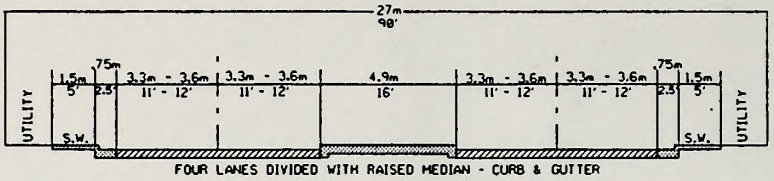
D.



SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

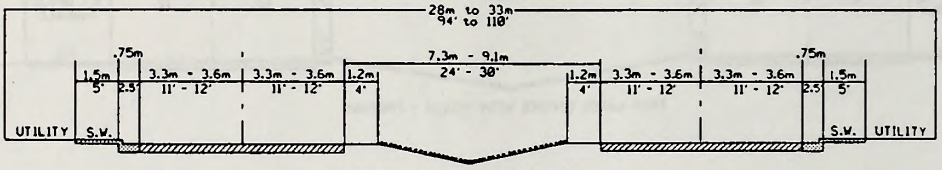
TYPICAL THOROUGHFARE CROSS SECTIONS

E.



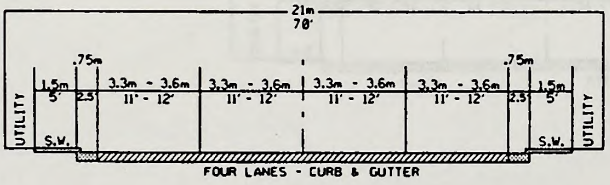
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



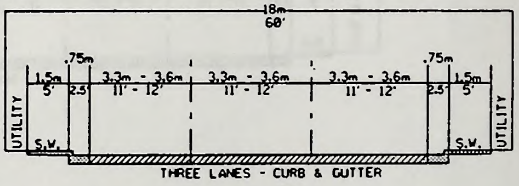
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

G.



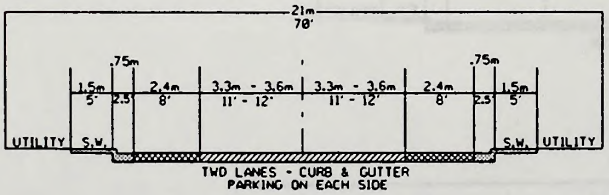
FOUR LANES - CURB & GUTTER

H.



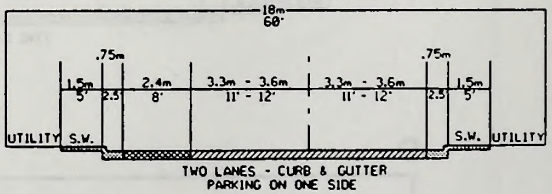
THREE LANES - CURB & GUTTER

I.



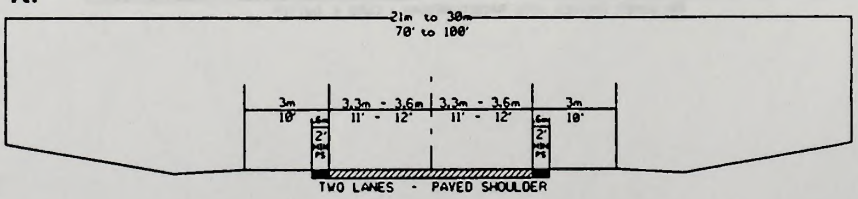
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

J.



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

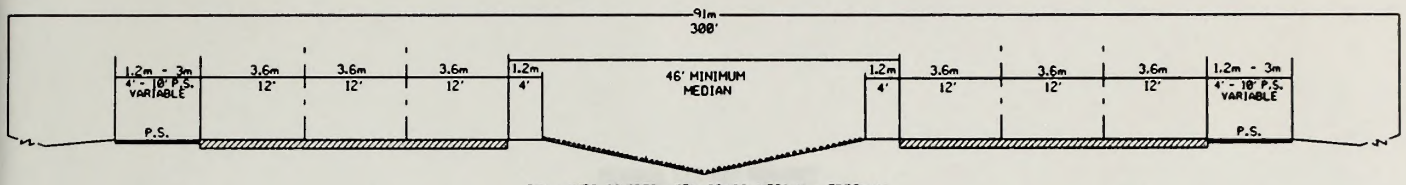
K.



TWO LANES - PAVED SHOULDER

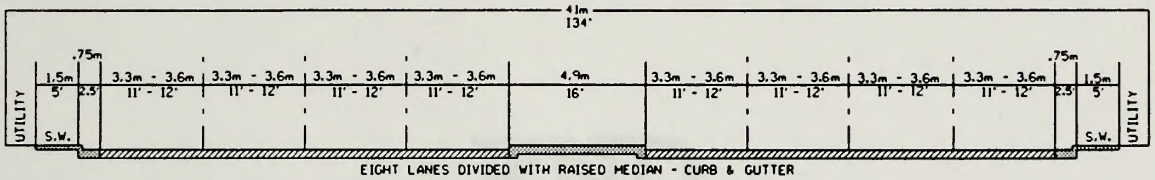
TYPICAL THOROUGHFARE CROSS SECTIONS

L.



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

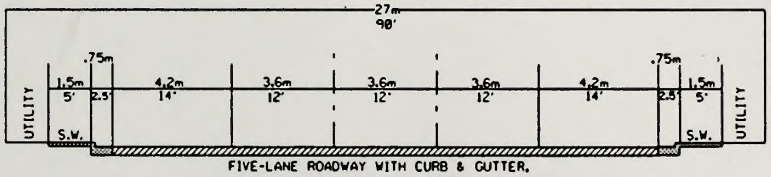
M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

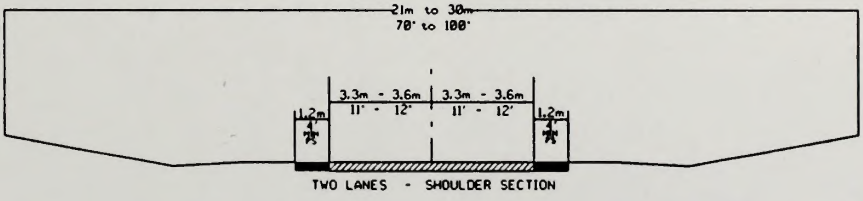
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



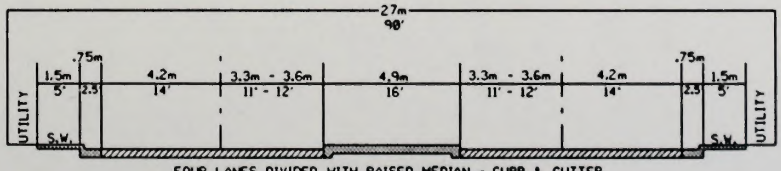
FIVE-LANE ROADWAY WITH CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

O.

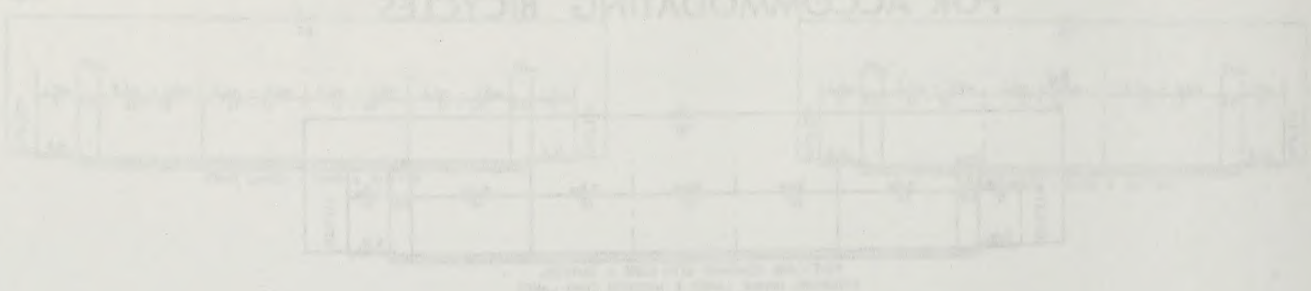


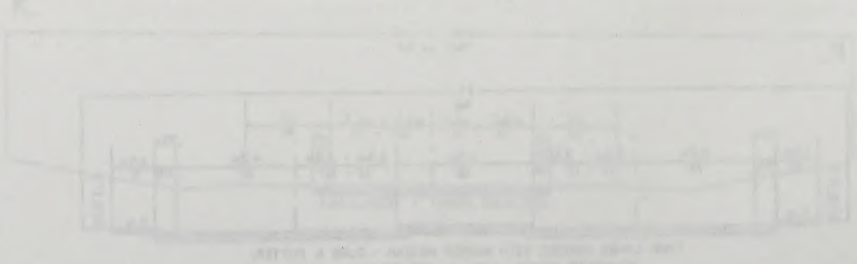
TWO LANES - SHOULDER SECTION

P.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES





THE

END